

FEASIBILITY STUDY REPORT

4144 GLENCOE AVENUE SITE

LOS ANGELES, CALIFORNIA 90292

Prepared on behalf of:

Cornell-Dubilier Electronics, Inc.

For Submittal to:



California Environmental Protection Agency

Department of Toxic Substances Control

1011 North Grandview Avenue

Glendale, California 91201

Prepared by:



GeoSyntec Consultants

2100 Main Street, Suite 150

Huntington Beach, California 92648

(714) 969-0800

www.GeoSyntec.com

June 2005



Alan C. Lloyd, Ph.D.
Agency Secretary
Cal/EPA

Department of Toxic Substances Control

1011 North Grandview Avenue
Glendale, California 91201



Arnold Schwarzenegger
Governor

October 13, 2005

Mr. Curtis L. Lopes
Corporate Facilities and Environmental Affairs Manager
1605 East Rodney French Boulevard
New Bedford, Massachusetts 02744

CORNELL-DUBILIER ELECTRONICS, FESIBILITY STUDY REPORT, 4144
GLENCOE AVENUE, LOS ANGELES, CALIFORNIA

Dear Mr. Lopes:

The Department of Toxic Substances Control (DTSC) has reviewed the Feasibility Study Report dated June 2005, and the Supplement to Feasibility Study Report dated September 2005 for the above Site. These reports meet the DTSC requirements and are hereby approved.

If you have any questions, please contact Mr. Ryan Kinsella, Project Manager, at (818) 551-2961 e-mail Rkinsell@dtsc.ca.gov or me, at (818) 551-2822.

Sincerely,

Sayareh Amir, Chief
Southern California Cleanup Operations Branch – Glendale Office

cc: Mr. Brian Hembacher
Deputy Attorney General
California Department of Justice
300 South Spring Street, Suite 1703
Los Angeles, California 90013

Ms. Laurie Burt
Foley Hoag LLP, Attorneys at Law
Seaport World Trade Center West
155 Seaport Boulevard
Boston, MA 02210-2600

Mr. Curtis L. Lopes
October 13, 2005
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cc: ✓ Mr. Mark D. Schultheis, P.E.
GeoSyntec Consultants
2100 Main Street, Suite 150
Huntington Beach, California 92648

Gregory D. Trimarche
Greenberg Traurig LLP
18300 Von Karman Avenue #850
Irvine, California 92612-1035



30 June 2005

Mr. Ryan Kinsella
Site Mitigation Cleanup Operations Southern California Branch A
California State Department of Toxic Substances Control
1011 North Grandview Avenue
Glendale, CA 91201

Subject: Feasibility Study Report
4144 Glencoe Avenue Site
Los Angeles, California 90292

Dear Mr. Kinsella:

GeoSyntec Consultants is pleased to submit this Feasibility Study report on behalf of Cornell-Dubilier Electronics, Inc. for the 4144 Glencoe Avenue Site in Los Angeles, California. The Feasibility Study Report includes Site information and evaluation in general accordance with *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA*. Five copies are enclosed for your use.

Please feel free to contact the undersigned with any questions or comments concerning Site activities. Thank you for your cooperation.

Sincerely yours,

Mark Schultheis, P.E.
Associate Engineer

Andrew Barnes, P.G.
Associate Geologist

Jaime Dinello
Senior Staff Engineer

Attachment

cc: Mr. Curt Lopes, Cornell-Dubilier Electronics, Inc.
Ms. Laurie Burt, Foley Hoag LLP
Mr. Gregory Trimarche, Esq., Greenberg Traurig, LLP
Mr. Anthony Ward, P.G., BBL



FEASIBILITY STUDY REPORT

**4144 Glencoe Avenue Site
Los Angeles, California**

June 2005

This report was prepared by the staff of GeoSyntec Consultants under the supervision of the engineer whose signature appears hereon. The findings or professional opinions were prepared in accordance with generally accepted professional engineering and geologic practice. No attempt to verify the accuracy of the data provided by third parties was made. No warranty is expressed or implied.



Mark D. Schultheis, P.E.
Associate

EXECUTIVE SUMMARY

This document presents the Feasibility Study (FS) report for the 4144 Glencoe Avenue Site (Site) in Los Angeles, California. The FS Report was prepared for submittal to the Department of Toxic Substances Control (DTSC) in accordance with the California Health and Safety Code.

Background (*FS Report Section 2*)

The Site is located in the Venice District of Los Angeles, California on an approximately 1.4-acre lot located on the northeast side of Glencoe Avenue. The Site is bounded to the southwest by Glencoe Avenue, to the northwest by an alley and adjacent industrial property, and to the northeast and southeast by additional light industrial buildings, paved parking, and storage areas.

The Site vicinity is in transition from light industrial and commercial use to mixed-use, consisting of commercial and residential use. The redevelopment trend has accelerated dramatically in 2004-2005, with many demolition and redevelopment projects in the area encompassing the Site. Formerly, the Site vicinity and Glencoe Avenue were utilized predominantly for manufacturing and light industrial/commercial use (including offices, retail shops, gas stations, car rental centers, machine shops, automobile repair shops, public parking lots, and restaurants).

The Site was used for industrial purposes from 1955 to the early-1980s. It was first occupied by Cornell-Dubilier Electronics (CDE) from 1955 until 1971 and then by the Zenith Food Processing Company (Zenith) from 1972 until approximately 1984. Since the mid-1980s, the Site has been used for a variety of commercial uses. A fitness center and associated parking area currently are located at the Site.

CDE's manufacturing activities consisted of assembling various types of electronic filters and capacitors. For an undetermined portion of this manufacturing period, polychlorinated biphenyls (PCBs) were used in the manufacture of some capacitors and filters. The vapor degreasing operation is believed to have used either

trichloroethylene (TCE) or 1,1,1-trichloroethane (1,1,1-TCA). CDE has no record of using tetrachloroethene (PCE) in any of its Site processes.

During 1972 to 1984, Zenith conducted industrial operations at the property that included formulation of a wax material used to coat fruit and the manufacture of machinery used to sort, wash, size, and coat fruits and vegetables. Zenith also repaired and refurbished food processing machinery at this facility. Zenith used and stored various solvents and paints at the facility in connection with its machine repair and refurbishing operations.

Remedial Investigation Summary

The nature and extent of contamination in soil, soil vapor, and groundwater and an area containing free-phase contaminants (source zone) at the Site have been assessed through several assessment programs conducted since 1986, as more fully described in the remedial investigation reports approved by DTSC in 2004.

The Site sampling results show that soil is primarily contaminated with TCE, PCE and PCBs. TCE and PCE also were detected in the soil vapor. In addition, the groundwater in the upper aquifer (known as the A/B aquifer system) contains both TCE and PCE, with concentrations remaining stable or showing a decreasing trend. The next lower aquifer, Aquifer C, shows no detectable concentrations of TCE, PCE or PCBs. Based on elevated concentrations of TCE and PCE at the Site, the RI concluded that solvent in the form of a dense non-aqueous phase liquid (DNAPL) was potentially present in the A/B aquifer system. Accordingly, additional Site investigation activities were completed in July 2004 through August 2004 to delineate the zone in which DNAPL may occur at the Site. The results of this work indicated probable DNAPL within the limited source zone at the Site. Contamination of groundwater is believed to occur as a result of dissolution of DNAPL within the source zone and subsequent migration of PCE and TCE from the source zone as dissolved contaminants in groundwater. Groundwater monitoring conducted over the past seven years indicated PCE and TCE contamination in the A/B aquifer system at, and downgradient of, the Site in the southwestern direction.

The potential for soil vapor to impact air quality inside the fitness center was evaluated during an air quality survey in July 1999. The air monitoring results indicate that VOCs in soil vapor beneath the building do not pose a significant health risk to workers or visitors to the fitness center under current operating conditions.

GeoSyntec notes that there has been significant research and discussion at both the national and international level regarding the potential for cleanup of DNAPL at contaminated sites. This research and discussion occurred because of the broad experience that has now been developed in dealing with DNAPL sites. A general finding of this experience is that DNAPL, when it occurs at a site, cannot be completely removed through typical soil and groundwater remediation techniques. USEPA commissioned a panel to review available DNAPL site data and develop alternate cleanup and risk management strategies. The conclusions of this panel's work were published by USEPA. The panel concluded that DNAPL cleanup strategies generally should acknowledge the technical impracticability that precludes removal of all DNAPL at a site and the associated impracticability in meeting numeric cleanup standards for soil and groundwater impacted by DNAPL. According to USEPA, cleanup strategies instead should focus on practicable reduction of DNAPLs, with risk management of residuals through engineered and/or institutional controls and monitoring. This strategy is reflected in the remedial action objectives for the Site.

Risk Assessment (*FS Report Section 4.3*)

A risk assessment (RA) report was prepared to evaluate potential health risks associated with chemicals detected in soil, soil vapor, and groundwater at the Site. The RA was approved by DTSC in May 2004.

The results of the RA indicated that there is no unacceptable risk for current on-site receptors, which include landscapers and utility workers, or current off-site receptors including commercial workers and residents. The results of soil vapor sampling conducted in June 2005 sampling will be used to re-evaluate risk to downgradient receptors, and a discussion of the results will be presented in a separate document.

The results of the RA also indicate that chlorinated VOCs and PCBs may pose an unacceptable health risk under a hypothetical future mixed use scenario at the Site consisting of first-floor commercial/residential use and upper-floor residential use. In addition, PCE and PCBs may pose an unacceptable health risk to future on-site landscapers and utility workers. This FS Report thus focuses on mitigating and minimizing potential risks from chlorinated VOCs and PCBs to hypothetical future residents, landscapers, utility workers, and possibly off-site commercial workers.

Feasibility Study Process

The Feasibility Study (FS) process, specified by the USEPA, is designed to provide sufficient information on potential remedial options so that informed decisions may be made. The FS process consists of developing remedial alternatives, screening these alternatives, and then performing a detailed analysis of the most applicable alternatives. There are several steps required to complete the FS process including:

- Developing Remedial Action Objectives (RAOs). Remedial Action Objectives are goals specific to various media (i.e., soil, groundwater) that are to be met by a remedy. The RAOs are based on the results of the Remedial Investigation (RI), the Risk Assessment and the expected future use of the Site (*FS Report Sec. 4*);
- Identifying and selecting applicable remedial technologies for soil and groundwater based on effectiveness, implementability and cost (*FS Report Sec. 5*);
- Developing remedial alternatives for the Site from the retained remedial technologies that either singly or in combination satisfy the RAOs (*FS Report Sec. 6*);
- Screening the remedial alternatives, then performing a detailed analysis of each of the final remedial alternatives (*FS Report Sec. 7*); and

- Performing a comparative analysis of the final remedial alternatives sufficient to provide the information necessary to select an appropriate remedy for the Site (*FS Report Sec. 8*).

Remedial Action Objectives (*FS Report Sec. 4.3*)

The RAOs are based on the results of the Remedial Investigation that determined that Site soil, Site groundwater and the Site source zone all contain hazardous substances from the Site. The RAOs also consider the expected future land use of the Site (a mixed-use commercial / residential building, consistent with other uses in the area), and the results of the Risk Assessment.

One RAO specifically addresses soils at the Site:

- Reduce risk from ingestion, inhalation, and dermal contact with soils to risk levels of $<1 \times 10^{-5}$ for future landscapers and utility workers. In addition, reduce risk so that the noncancer hazard index (HI) is <1 .

Other RAOs are focused on the source zone and groundwater at the Site, along with the soil vapor that is associated with the source zone:

- Reduce VOCs through application of appropriate in-situ remedial technology in source zone of known high VOC concentrations.
- Provide adequate controls to reduce indoor air exposure to chlorinated VOC soil vapor concentrations to risk levels of $<1 \times 10^{-6}$ for future on-site residents. In addition, reduce risk so that the noncancer HI is <1 .
- Manage the residual dissolved phase plume to limit future risk to off-site receptors: maintain risk levels of $<1 \times 10^{-6}$ for future off-site residents, and $<1 \times 10^{-5}$ for future landscapers and utility workers; non-cancer hazard index of <1 .

- Manage the residual dissolved phase plume to demonstrate acceptable future risk to on-site receptors: risk levels of 1×10^{-6} for future on-site residents and 1×10^{-5} for future landscapers and utility workers.
- Manage the residual dissolved phase plume so that chemical concentrations continue to exhibit insignificant risk to ecological receptors downgradient of the Site.
- Manage the residual dissolved phase plume so that the deep aquifer beneath the Site is protected.

Cleanup criteria for the Site were developed with consideration given to the hypothetical future use scenario which includes a building anywhere on the Site, configured to accommodate first floor non-residential use and upper floor residential use; remedial action objectives; and potential Site health risk. The cleanup criteria were developed for each of the three COCs identified (TCE, PCE and PCBs). Cleanup criteria either are numeric goals to be achieved through remediation or are non-numeric performance-based criteria. The cleanup criteria will be used to select and screen remedial technologies and to develop and analyze remedial alternatives.

Applicable Remedial Technologies (*FS Report Section 5*)

Potentially applicable technologies for Site remediation were identified and then screened based on effectiveness, implementability and cost. These technologies were further screened and integrated into one or more preliminary remedial alternatives, summarized below:

Alternative 1, No Action, consists of no remedial actions or institutional controls to address Site contaminants. Alternative 1 is included as required by USEPA guidance.

Alternative 2, Selective Excavation and Electrical Resistive Heating, includes excavation of impacted soils and removal of VOCs and DNAPL mass in the source zone / groundwater via electrical resistive heating. Selective excavation of soils

would effectively mitigate direct contact with impacted soils as well as remove high concentrations of PCB-impacted soil and mitigate the potential for PCB-impacted soil to degrade groundwater. Use of electrical resistive heating would effectively destroy DNAPL mass in the unsaturated and saturated portions of the source zone, thereby mitigating the major risk driver at the Site. The alternative would provide significant mass reduction and was retained for detailed analysis because it meets the threshold criteria of overall protection of human health and the environment, and it meets ARARs.

Alternative 3, Selective Excavation and In-Situ Chemical Oxidation, also includes excavation of impacted soils and removal of VOCs and DNAPL mass in the source zone / groundwater via in-situ chemical oxidation. Selective excavation of soils would effectively mitigate direct contact with impacted soils as well as remove high concentrations of PCB-impacted soil and mitigate the potential for PCB-impacted soil to degrade groundwater. In-situ chemical oxidation would treat DNAPL mass in the saturated portion of the source zone, but it is not judged to be as effective at DNAPL source zone reduction as is electrical resistive heating, since in-situ chemical oxidation would not effectively treat the unsaturated portion of the source zone and likely would not remediate all DNAPL within the saturated portion of the source zone. It is not as effective in treating fine-grained soils as is electrical resistive heating. In-situ chemical oxidation would provide significant mass reduction, however, and will be retained for detailed analysis because it meets the threshold criteria of overall protection of human health and the environment, and it meets ARARs.

Alternatives 2 and 3 also include the following common elements:

Institutional Controls - The anticipated institutional controls for the Site would prohibit sensitive land uses (i.e., single family residence, hospitals, schools, or child-care centers), specify new building construction (i.e., first floor non-residential, upper floor residential, and inclusion of vapor control system), and prohibit on-site groundwater extraction for municipal (i.e., drinking water purposes), industrial, and agricultural (i.e., irrigation) use.

Engineered Controls - Engineered controls such as vapor control systems, in conjunction with an active remedy, would mitigate potential risk for two hypothetical future on-site receptors: on-site residents and on-site commercial workers. Future Site construction is likely to be slab on grade construction or first floor (or subterranean) parking and would include an underlying vapor control system comprising a geocomposite vapor barrier under the concrete slab, an air inlet, a vapor outlet, and vapor monitoring points consistent with current building practice. The vapor control system would be a part of any future construction, whether or not vapor controls were warranted.

Groundwater Monitoring - Groundwater monitoring currently is conducted at the Site and would continue on Site and downgradient of the Site in the A/B aquifer system in wells designed to assess VOC concentrations and plume stability. The groundwater monitoring program would be developed as part of the remedial design and conducted in conjunction with an active remedy. Annual groundwater sampling is proposed for a period of five years after active remediation is complete, until the five-year remedy review, or until the dissolved phase concentrations have shown an acceptable and persistent downward trend.

The downgradient off-site potential risk currently is acceptable. Following DNAPL remediation (i.e., source removal via remediation), a declining trend is expected in downgradient groundwater VOC concentrations, resulting in lower risk on Site and off Site.

Post-Remedy Soil Vapor Baseline Survey - After the remedy is complete, there should be an observable declining trend in Site-wide soil vapor concentrations, given that the source zone is believed to be the source of the soil vapor. A soil vapor survey would be conducted after the source zone remedy is complete to provide a baseline understanding of residual soil vapor concentrations throughout the Site. The results of the soil vapor baseline survey also would be used to assess the need for, and nature of, institutional controls.

Overview of Detailed Analysis of Remedial Alternatives (*FS Report Section 7.2*)

USEPA guidance specifies the use of nine criteria for the detailed analysis of each remedial alternative. The first two criteria, considered “threshold criteria,” are:

- The overall protection of human health and the environment; and
- The ability to satisfy regulatory criteria (referred to as applicable or relevant and appropriate requirements, or ARARs).

Any remedy that is chosen must satisfy these two criteria. The next five criteria are called “balancing criteria.” They are used to make the primary distinctions among the remedial alternatives. These five criteria are:

- Long-term effectiveness and permanence;
- Reduction of toxicity, mobility and volume of waste through treatment;
- Short-term effectiveness;
- Implementability; and
- Cost.

An alternative that meets the threshold criteria and strikes the best “balance” among the five balancing criteria generally is considered to be the preferred remedial alternative.

The final two criteria are:

- Community acceptance; and
- State acceptance.

USEPA guidance requires evaluation of these two criteria following public comment on the FS Report. Although not formally considered at this stage of the feasibility process, the views of the community and the state have been considered in the development of the FS Report and they will be considered further in the final remedy selection by DTSC.

Detailed Analysis of Remedial Alternatives (FS Report Section 7.3)

Alternative 1, No Action, does not meet the threshold criteria and thus is not considered further. Alternatives 2 and 3 are analyzed against each of the identified criteria. The results of the detailed analysis, presented in Section 7 and in Table 7-1, are summarized below through the comparative analysis of alternatives conducted in Section 8 of the FS Report.

Comparative Analysis of Alternatives (FS Report Section 8)

Overall Protection of Human Health and the Environment - Alternative 2, Selective Excavation and Electrical Resistive Heating, would meet the threshold requirement of protectiveness more easily than would Alternative 3, Selective Excavation and In-Situ Chemical Oxidation, because of the greater degree of DNAPL and VOC mass that would be destroyed through the use of electrical resistive heating as opposed to in-situ chemical oxidation. Institutional controls and engineered controls would provide added protectiveness for each alternative.

Alternatives 2 and 3 each would remove soils containing high concentrations of PCBs, thereby mitigating the ingestion and direct contact risk of these soils. Alternative 2 also would provide protection by effectively reducing DNAPL and VOC contamination both in the unsaturated and saturated portions of the source zone through electrical resistive heating, which would mitigate indoor air risk from soil vapor as well as managing the dissolved phase plume. Alternative 3 also would reduce the mass of DNAPL and VOCs within the saturated portion of the source zone through in-situ chemical oxidation, which would mitigate risk to indoor air exposure as well as manage the dissolved phase plume. Alternative 3 likely would not remove as much DNAPL mass as Alternative 2 within the source zone, however, and would not remove DNAPL or VOC mass appreciably in the unsaturated portion of the source zone.

Compliance With ARARs - Alternatives 2 and 3 would perform equally well with respect to compliance with ARARs. Each of these two alternatives would meet the threshold requirement of ARARs compliance.

Long-term Effectiveness and Permanence - Alternative 2, Selective Excavation and Electrical Resistive Heating, is ranked higher than Alternative 3, Selective Excavation and In-Situ Chemical Oxidation, with respect to long-term effectiveness and permanence. Each alternative would provide a long-term, permanent solution that would be protective of human health and the environment. However, electrical resistive heating is shown to be more effective in destroying a DNAPL source as it acts in both the vadose and the saturated zone; whereas, in-situ chemical oxidation is effective primarily in the saturated zone. Moreover, electrical resistive heating likely would remove more contaminant mass within the saturated portion of the source zone than would in-situ chemical oxidation because it is more effective in addressing contamination in finer-grained soils and in removing DNAPL. Alternatives 2 and 3 each remove PCB-impacted soil, mitigating the risk from ingestion and/or direct contact. Alternatives 2 and 3 each provide for long-term protection of receptors in a future building on Site because of the inclusion of vapor control systems.

Reduction of Toxicity, Mobility, and Volume Through Treatment - Alternatives 2 and 3 each would reduce toxicity, mobility, and volume through in-situ treatment of the source zone. Electrical resistive heating (as part of Alternative 2) would provide more source zone mass reduction than in-situ chemical oxidation (part of Alternative 3), since electrical resistive heating is able to destroy DNAPL mass in the unsaturated and saturated zones, whereas in-situ chemical oxidation is effective primarily in the saturated zone. As discussed above, Alternative 2 likely would remove more contaminant mass in the saturated zone as well, since the electrical resistive heating technology performs better, particularly on fine-grained soils where DNAPL likely resides, than in-situ chemical oxidation.

Short-term Effectiveness - Alternatives 2 and 3 would perform equally well with respect to short-term effectiveness, and would present few short-term effectiveness issues. Electrical resistive heating would provide treatment relatively quickly in the source zone, whereas in-situ chemical oxidation would take somewhat longer.

Implementability - Neither of the alternatives would pose significant implementation issues. Each alternative would be implemented in a matter of weeks after administrative actions and work plans are completed. The electrical resistive heating system can be completely installed in the subsurface (i.e., installation and operation would not disturb current activities at or near the Site, or in connection with Site redevelopment). Contractors, materials, and services are commonly used and available for each of Alternatives 2 and 3.

Cost - Alternatives 2 and 3 are both moderately high and comparable with respect to cost. The estimated cost of Alternative 2 (total cost with non-discounted O&M) is \$1,783,000, and the estimated cost of Alternative 3 (total cost with non-discounted O&M) is \$1,680,000.

Preferred Remedial Alternative (*FS Report Section 8.3*)

Based on the comparative analysis of the remedial alternatives, the remedial alternative that ranks the highest is Alternative 2, Selective Excavation and Electrical Resistive Heating. Alternative 2 would effectively mitigate the risk from ingestion, inhalation, and dermal contact with on-Site soils for future non-residential and residential occupants of buildings on Site, and future landscapers and utility workers. Electrical resistive heating in the source zone effectively would treat the primary source of contamination on the Site, thereby mitigating potential indoor air exposures. Electrical resistive heating would achieve mass removal of PCE and TCE in DNAPL phase as well as reducing VOC concentrations in the dissolved phase plume. Electrical resistive heating is the best technology available for the Site, as it is proven to effectively remove DNAPL in unsaturated soils as well as in saturated zones. Based on the Site-specific data within the source zone and groundwater, if electrical resistive heating cannot achieve RAOs, no other technology reviewed can do so either. Institutional and engineered controls also would prevent and mitigate the potential indoor air inhalation of any residual soil vapor of concern at the Site. Groundwater monitoring would be conducted for the dissolved phase plume and would raise awareness of any possible increase in VOC concentrations.

Potential PCB exposures to future landscapers and utility workers would be mitigated through excavation of shallow soils. Additional mass removal of PCBs would be achieved through the removal of high-concentrations of PCBs in the soil column within the source zone. Alternative 2 would readily meet the criterion of overall protection of human health and the environment and would satisfy ARARs. When evaluated against the balancing criteria, Alternative 2 would provide short-term effectiveness as well as long-term effectiveness and permanence. It also would reduce the toxicity, mobility, and volume of COCs in soil and in groundwater. It would be readily implementable and presents an effective balance of cost against the other criteria. Alternative 2 also would do the best job of accommodating future redevelopment of the Site.

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1. INTRODUCTION

1.1 Terms of Reference

This document presents the Feasibility Study (FS) Report for the 4144 Glencoe Avenue Site (Site) in Los Angeles, California. The FS Report was prepared for submittal to the Department of Toxic Substances Control (DTSC) in accordance with the California Health and Safety Code.

1.2 Description of Feasibility Study Process

The Remedial Investigation (RI) for the Site comprises three separate reports: the Groundwater Remedial Investigation Report [URS, 2004a]; the Revised Soil Remedial Investigation Report [URS, 2004b]; and the Supplemental RI Report [URS, 2004c]. The Groundwater Remedial Investigation Report and the Revised Soil Remedial Investigation Report were approved by DTSC in May 2004. The Supplemental RI Report also was approved by DTSC in 2004. The FS Report for the Site includes the following information and evaluations in general accordance with *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA* [USEPA, 1988]:

- Background information on the Site, including a summary of investigative and remedial work performed to date;
- Future use of the Site, future risk exposure pathways, and receptors that may be at risk;
- Remedial Action Objectives (RAOs) and cleanup criteria;
- Identification of remedial technologies that potentially can be employed to remediate the Site contaminants;
- Screening of the remedial technologies to those that can realistically remediate the Site;

- Development of a range of potential remedial alternatives from the remedial technologies. Remedial technologies typically address one impacted medium at a site (e.g., soil or groundwater), whereas remedial alternatives represent combinations of remedial technologies that can address all contaminated media at a site;
- Screening of the remedial alternatives to those that can realistically remediate the Site;
- Analysis of remedial alternatives using United States Environmental Protection Agency (USEPA) criteria; and
- Comparative analysis of remedial alternatives that will result in identification of the preferred remedial alternative for the Site.

1.3 Organization

This document is organized into the following sections:

- Section 2 – “Site Background,” describes the history and physical characteristics of the Site, including hydrogeology;
- Section 3 – “RI Summary,” summarizes the results of the remedial investigation;
- Section 4 – “Remedial Action Objectives and Cleanup Criteria,” summarizes the findings of the baseline human health and ecological risk assessments and identifies the potential future use of the Site, future risk exposure pathways, and potential receptors that may be at risk. The remedial action objectives also are identified, along with cleanup criteria selected to achieve those objectives;
- Section 5 – “Technology Identification and Screening,” identifies potential remedial technologies. The remedial technologies are then

screened based on their effectiveness, implementability, and cost to address human health risks and ecological risks associated with these media;

- Section 6 – “Development of Remedial Alternatives,” uses the retained technologies from Section 5 to compile remedial alternatives that address a range of potential response actions and technical approaches for the Site. Remedial alternatives are further screened and evaluated in terms of effectiveness, implementability, and cost to identify the final set of remedial alternatives for detailed analysis;
- Section 7 – “Detailed Analysis of Alternatives,” presents a nine-criteria analysis of the final remedial alternatives;
- Section 8 – “Comparative Analysis of Alternatives,” uses the nine-criteria analysis results to compare the alternatives to assess which alternative provides the best balance of the nine criteria, and is, therefore, the recommended alternative; and
- Section 9 presents the FS Report references.

Tables, figures, appendices and exhibits are included at the end of this FS Report.

2. SITE BACKGROUND

2.1 General

This section includes the following background information on the Site:

- Site Location and Description;
- Site History;
- Physical Setting;
- Regional Hydrogeology;
- Site Hydrogeology; and
- Groundwater Production

The information presented in this section generally has been excerpted from the Groundwater Remedial Investigation report [URS, 2004a].

2.2 Site Location and Description

The Site is located in the Venice District of Los Angeles, California (Figure 2-1) on an approximately 1.4-acre lot located on the northeast side of Glencoe Avenue. It is identified by the Los Angeles County Assessors Parcel Number 4230-006-008/9. The current property configuration consists of a fenced parking area, a building structure, and landscaped frontage. The Site is bounded to the southwest by Glencoe Avenue, to the northwest by an alley and adjacent industrial property, and to the northeast and southeast by additional light industrial buildings, paved parking, and storage areas [URS, 2004a]. The Site layout is presented on Figure 2-2.

The Site vicinity is in transition from light industrial and commercial use to mixed-use, consisting of commercial and residential use. The redevelopment trend has accelerated dramatically in 2004-2005, with many demolition and redevelopment projects underway on Glencoe Avenue and on Redwood Avenue between Maxella Avenue to the south and W. Washington Boulevard to the north. This area encompasses the Site. Formerly, the Site vicinity was utilized primarily for light industrial/commercial use (including offices, retail shops, gas stations, car rental

centers, machine shops, automobile repair shops, public parking lots, and restaurants) and residential area (including multi-story apartment complexes and homes). Southwest of the Site is a commercial shopping center, including a Gelson's Market and Sporting Goods store. Apartment complexes and residential homes are located on streets to the west of the commercial and light industrial areas across from the Site. Figure 2-3 illustrates the land use in the Site vicinity.

2.3 Site History

The Site was used for industrial purposes from 1955 to the early-1980s. It was first occupied by Cornell-Dubilier Electronics (CDE) from 1955 until 1971 and then by the Zenith Food Processing Company (Zenith) from 1972 until approximately 1984. Since the mid-1980s, the Site has been used for a variety of commercial uses. A fitness center and associated parking area are currently located at the Site.

During the period when CDE occupied the property, the Site consisted of a main structure of approximately 15,000 sq ft, a small concrete platform behind the main building, shed, and parking areas (Figure 2-2). The parking areas reportedly were completely paved prior to the mid-1960s [URS, 2004a].

The manufacturing operations took place within the main structure. It contained five production rooms, a laboratory, a prototype department, a quality control room, and office areas. Between 1955 and 1971, manufacturing activities consisted of assembling various types of electronic filters and capacitors. The CDE manufacturing operation included both impregnating the filters and capacitors with oil and vapor degreasing associated with cleaning assembled capacitors. For an undetermined portion of this manufacturing period, polychlorinated biphenyls (PCBs) were used in the manufacture of some capacitors and filters. The vapor degreasing operation was conducted by using either trichloroethylene (TCE) or 1,1,1-trichloroethane (1,1,1-TCA). CDE reportedly has no record of using tetrachloroethene (PCE) in any of its Site processes [URS, 2004a].

From approximately 1972 to 1984, Zenith conducted industrial operations at the property that included formulation of a wax material used to coat fruit, and the manufacture of machinery used to sort, wash, size, and coat fruits and vegetables.

Zenith also repaired and refurbished food processing machinery at this facility. Zenith used and stored various solvents and paints at the facility during its repairing and refurbishing operations [URS, 2004a].

The fitness center currently located at the Site utilizes the main building and the parking area. In front of the main building along Glencoe Avenue is a small grass area and planters [URS, 2004a].

2.4 Physical Setting

The Site topography is nearly flat with an approximate elevation of 23 ft above mean sea level. Surface drainage is to the southwest, towards Glencoe Avenue. The Site is situated within the Ballona Gap subarea of the Santa Monica Groundwater Basin, which underlies the Los Angeles Coastal Plain. The Ballona Gap is a partially filled channel of the ancestral Los Angeles River. The ancestral Los Angeles River formerly flowed westward from its current southward path through the Dominguez Gap. The Ballona Gap, which was formed by the Los Angeles River and Ballona Creek, was subsequently channelized and partially refilled with sand, gravel and riprap [URS, 2004a].

2.5 Regional Hydrogeology

The Site is located in the Santa Monica Groundwater Basin (SMGB) which underlies the Coastal Plain of Los Angeles County. The Coastal Plain is a downwarped structural basin filled with sediments up to 13,000 ft thick. Four distinct groundwater basins underlie the Coastal Plain, including the Santa Monica Basin, the Hollywood Basin, the West Coast Basin, and the Central Basin. The portion of the Coastal Plain overlying the SMGB can be subdivided into six subareas, including the Santa Monica Plain, the Sawtelle Plain, the Ocean Park Plain, the Beverly Hills, the Baldwin Hills, and the Ballona Gap. The Site is located in the Ballona Gap subarea [URS, 2004a].

The SMGB is bordered by the Santa Monica Mountains on the north and the Ballona Escarpment on the south. The SMGB extends eastward from the Pacific Ocean to the Newport-Inglewood fault zone. The unconsolidated sediments within the SMGB

are recent alluvium, the Upper Pleistocene Lakewood Formation, and the Lower Pleistocene San Pedro Formation. Underlying the San Pedro Formation is the consolidated Pliocene Pico Formation. The base of the fresh-water-bearing sediments is reported as several hundred feet below the top of the Pico Formation [URS, 2004a].

Figure 2-4 shows the location of the Site in relation to the Ballona Gap, and Figure 2-5 shows a regional hydrostratigraphic cross-section near the Site vicinity. The map and cross-section were prepared from a California Department of Water Resources (CDWR) 1961 study and provide an overview of the regional hydrostratigraphy [CDWR, 1961]. Contacts with DTSC, the Regional Water Quality Control Board (RWQCB), and CDWR staff indicate that the 1961 CDWR study of the Coastal Plain and its underlying groundwater basins and a study by the U.S. Geological Survey in 1959 [Poland et al., 1959] are the most recent comprehensive studies of the regional hydrogeology in the area. More recent studies have been smaller in scope and related to specific sites [URS, 2004a].

The CDWR reports that the unconsolidated sediments in the general vicinity of the Site are generally 250 to 300 ft thick. Beginning at the land surface, these unconsolidated sediments include in descending order: the Bellflower Aquitard; the Ballona Aquifer; an unnamed aquitard; and the Silverado Aquifer. The following descriptions of the unconsolidated sediments, listed in bullets, were prepared from CDWR [1961]:

Bellflower Aquitard: The Bellflower Aquitard consists of a clay and sandy clay layer approximately 20 ft thick (referred to as the Bellflower Aquiclude in CDWR, 1961). The low-permeability sediments of the Bellflower Aquitard are consistent with the types of sediments present at shallow depths beneath the Site. Additionally, a review of boring logs for environmental site assessments near the Site indicate that shallow sediments are generally low-permeability silts, clays, and combinations of silts, clays, and sands [URS, 2004a].

Ballona Aquifer: The Ballona Aquifer consists primarily of sand, gravel, and cobbles. The CDWR indicates that the base of the Ballona Aquifer occurs at a depth of about 40 ft bgs at the Site, and the unit is approximately 20 thick in the Site vicinity. Below the Ballona Aquifer and above the underlying Silverado Aquifer, CDWR data indicate that an unnamed aquitard separates the two units in the Site vicinity. This aquitard is reported to consist of low-permeability sediments, primarily clay layers, which vary in extent and thickness in the Ballona Gap area. As shown on Figure 2-5, this unnamed aquitard is expected beneath the Site [URS, 2004a].

Silverado Aquifer: The Silverado Aquifer consists of sand and gravel with minor clay layers. The aquifer is approximately 200 ft thick in the vicinity of the Site, and the depth to its base is approximately 250 to 300 ft bgs [URS, 2004a].

2.6 Site Hydrogeology

The understanding of the local hydrogeology was developed based on review of available regional geologic reports such as Poland et al. [1959] and CDWR [1961], as well as logs from the numerous soil borings and cone penetrometer tests (CPTs) completed as part of the Site RI. In addition to the numerous borings advanced between the mid-1980s and 2000, URS advanced 31 CPT probes to depths of 73 ft bgs and advanced three mud-rotary boreholes to depths of 90 ft bgs. Results of these assessments indicate that the local stratigraphy consists of alternating permeable zones (sand and gravel) and less permeable zones (silt and clay) to depths of at least 90 ft bgs. In general, the stratigraphy encountered in the CPT and mud-rotary boreholes is consistent with the regional hydrostratigraphy. Observations and nomenclature used for the local hydrostratigraphic units are presented in the following bullets. The interpreted regional hydrostratigraphic unit nomenclature is indicated in parentheses [URS, 2004a].

- Aquitard A (Bellflower Aquitard) - occurs from ground surface to approximately 20 ft bgs and generally consists of unsaturated fine-grained materials, principally silt, clay and fine sand. Aquitard A is considered the vadose (unsaturated) zone.

- Aquifer A (Ballona Aquifer) – first groundwater occurs from about 20 to 30 ft bgs in strata consisting principally of sands and gravelly sands. The basal portion of Aquifer A is typically coarser grained than the upper portion.
- Aquitard B (fine-grained unit within Ballona Aquifer) - generally occurs from 30 ft bgs to 35 ft bgs. However, Aquitard B is absent in the eastern portion of the Site and thickens to approximately 8 ft in the western portion of the Site. Aquitard B consists of silt and clayey silt.
- Aquifer B (Ballona Aquifer) - generally occurs from 35 ft bgs to 52 ft bgs. Several thin (less than 2 ft thick) fine-grained units occur within Aquifer B. During the RI, several CPT locations encountered contained coarse-grained sediments in Aquifer B that could not be penetrated.
- Aquitard C (unnamed aquitard separating Ballona Aquifer and Silverado Aquifer) - generally occurs from about 50 ft bgs to at least 60 ft bgs in the general Site vicinity. Aquitard C ranges in thickness from about 10 to 15 ft and consists primarily of silt and clay.
- Aquifer C (Silverado Aquifer) - occurs below 65 ft bgs and consists of fine to medium-grained sand. Aquifer C is approximately 200 ft thick in the vicinity of the Site, and the depth to its base is approximately 250 to 300 ft bgs.

2.7 Groundwater Production

The closest groundwater production wells completed in Aquifer C within the Santa Monica Basin are two inactive well fields located approximately two miles north and northeast of the subject property, in an upgradient direction. The two well fields are the City of Santa Monica Arcadia Well Field and the Southern California Water Company Charnock Well Field. The wells within these two well fields were shut down in 1996 and 1997 due to the presence of methyl tertiary butyl ether (MTBE) in the groundwater. Water formerly extracted from these fields contained detectable concentrations of VOCs, primarily TCE and PCE, which required well-head treatment

to remove the contaminants prior to distribution to customers. The City of Santa Monica water supply Well No. SM-1 is located more than four miles north (upgradient) of the Site. [URS, 2004a].

3. RI SUMMARY

3.1 General

The nature and extent of impacts to soil, soil vapor, and groundwater at and surrounding the Site have been assessed through several programs conducted since 1986. The following sections provide a summary of findings for each of these media and include the following information:

- Soil Assessment Results;
- Soil Vapor Assessment Results;
- Groundwater Assessment Results; and
- Source Zone Assessment Results.

The information presented in this section generally has been excerpted from the Groundwater Remedial Investigation Report [URS, 2004a], the Revised Soil Remedial Investigation Report [URS, 2004b]. Since these reports were approved by the DTSC, supplemental data have been collected at the Site to support pre-remedial design activities. These reports also are summarized within this section.

3.2 Soil Assessment Results

From 1986 to 1999, more than sixty soil borings were advanced and sampled at the Site. The field assessments were conducted under the oversight of one or more representatives of the DTSC or the California Department of Health Services (DHS) [URS, 2004a]. The soil borings and sampling locations can be seen in Figure 3-1.

3.2.1 Initial Assessments in Known Areas of Contamination

Three soil assessments were initially performed at the Site and were concentrated primarily on the known areas of soil impacts east of the main building. Two soil assessments were conducted by Meredith/Boli & Associates, Inc. (MB&A), and one soil assessment was conducted by TerraNext. The fieldwork for the two soil assessments by MB&A was performed in 1986 and 1987, while the fieldwork for the TerraNext assessment was performed in 1996 [URS, 2004b].

3.2.1.1 MB&A Soil Assessment (1986 and 1987)

Twenty borings were advanced during the MB&A assessments in 1986 and 1987. The MB&A borings were designated as BH-1 through BH-20 and advanced to a maximum depth of 30 ft bgs (Figure 3-1). Ninety-two soil samples were collected during the 1986 and 1987 field assessments and analyzed for PCBs, volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and metals. Table 3-1 presents a summary of the samples analyzed, the soil samples that contained a detectable concentration of the chemical constituents analyzed, and the concentration range of the detected chemical constituents [URS, 2004b].

3.2.1.2 TerraNext Soil Assessment (1996)

Fourteen borings were advanced during the TerraNext Site assessment. The TerraNext borings were designated as BH-21 through BH-34 and advanced to a maximum depth of 34.5 ft bgs (Figure 3-1). Eighty-nine soil samples were collected during the 1996 field assessment and collectively analyzed for PCBs, VOCs, SVOCs, and metals [URS, 2004b]. A summary of the soils collected and chemicals detected during the assessment is presented in Table 3-1.

3.2.1.3 Analytical Results

Based on the frequency of detection, the most prevalent chemicals of concern (COCs) were PCBs, PCE, and TCE [URS, 2004b]. Summaries of soil sample analytical results for VOCs, PCBs, and metals generated during the MB&A and TerraNext assessments are presented in Tables 3-2 through 3-4, respectively.

Soils containing PCBs were found primarily within an area located approximately 50 ft east of the main building. The area contains varying concentrations of PCBs and is approximately 50 ft by 50 ft. A total of 184 samples collected at the Site were analyzed for PCBs. Of the 31 soil samples containing PCBs at concentrations greater than 50 milligrams per kilogram (mg/kg), 27 were collected from this central

location. The remaining four samples containing PCB concentrations greater than 50 mg/kg were found in borings located in close proximity to the primary area of PCB-impacted soil and in areas to the east of the impacted region, representing shallow and laterally limited areas of impacted soil [URS, 2004b].

As indicated in the Table 3-1, TCE and PCE were the most prevalent VOCs detected. Of these two chemical constituents, TCE was generally detected at concentrations lower than PCE. In addition, TCE was generally co-located with PCE. Concentrations of TCE and PCE ranged from 0.01 mg/kg to 2,100 mg/kg with the highest concentrations located in the area where PCB concentrations were highest. Concentrations of other VOCs ranged from 0.0057 mg/kg to 1,300 mg/kg, and included cis-1,2-dichloroethylene (cis-1,2-DCE); 1,2,3-trichlorobenzene (1,2,3-TCB); 1,2,4-trichlorobenzene (1,2,4-TCB); 1,3-dichlorobenzene (1,3-DCB); 1,4 dichlorobenzene (1,4-DCB); methylene chloride and toluene [URS, 2004b].

Four soil samples collected from BH-22 and BH-30 were analyzed for SVOCs. None of the samples collected contained SVOC concentrations greater than detection limits [URS, 2004b].

During the TerraNext assessment, two soil samples were analyzed for California Code of Regulations (CCR) Title 22 metals. The soil samples analyzed were collected from soil borings BH-22 and BH-27. Detectable concentrations of the following metals were measured: antimony, barium, chromium, cobalt, copper, lead, nickel, silver, selenium, thallium, vanadium and zinc [URS, 2004b].

3.2.2 Additional Soil Assessments

Dames & Moore (D&M) (now URS Corporation) performed additional work to assess areas of known contamination found during previous assessments and to evaluate the possibility of other impacted soils at the Site. The additional assessment, described below, was performed in three phases during November 1998, May 1999, and August 1999 [URS, 2004b].

3.2.2.1 November 1998 Sampling

Soil samples were collected on 3 and 4 November 1998 and were analyzed for PCBs, SVOCs and metals. Seventy-nine soil samples were collected at all boring locations for PCB analysis. Nine soil samples were collected at eight boring locations for SVOC analysis. PCB (specifically Arochlor 1254) was detected in sixteen of the seventy nine samples at low concentrations (0.0091 mg/kg – 1.0 mg/kg). SVOCs were not detected in soil samples collected during the November 1998 sampling event [URS, 2004b]. The results of the SVOC and PCB analyses can be found in Tables 3-5 and 3-6, respectively.

Twenty four soil samples were collected at ten boring locations and analyzed for metals. The results of the metal analyses were compared to background concentrations for metals in California soil. The source of the background concentrations for metals was *Background Concentrations of Trace Major Elements in California Soils*, prepared by the Kearney Foundation of Soil Science at the University of California, Riverside [UC Riverside, 1996]. Lead and selenium were found at concentrations greater than background in Borings SB-26 and SB-11, respectively. Twelve soil borings contained arsenic in concentrations greater than background (11.3 mg/kg to 14.5 mg/kg). The maximum background concentration of arsenic is reported as 11 mg/kg in the referenced document [URS, 2004b]. The results of the analysis can be found in Table 3-7.

3.2.2.2 May 1999 Sampling

Additional soil sampling was performed on 23 May 1999 to evaluate soil concentrations located under the northeastern and southeastern portions of the building, with some locations designated just outside of the building footprint. The sampling located under the northeastern portion of the building was performed to evaluate soil concentrations located under the former impregnation room and laboratory, while the samples located under the southeastern portion of the building were used to delineate areas where soil contamination had been detected previously [URS, 2004b].

Six soil samples were collected at five locations under the northeastern portion of the building (SB-30, SB-31, SB-57, SB-58 and SB-59) for PCB analysis. Four samples were collected at four locations under the southeastern portion of the building (SV-31, SV-57, SV-58 and SV-59) for hexavalent chromium analysis (Figures

3-1 and 3-2). Neither PCBs nor hexavalent chromium was detected in any soil samples. The results can be found in Tables 3-8 and 3-9, respectively [URS, 2004b].

3.2.2.3 August 1999 Sampling

On 28 and 29 August 1999, additional soil samples were obtained from beneath the main building at the Site. The purpose of this sampling was to assess additional areas under the building [URS, 2004b].

During the August sampling, soils were sampled for PCBs at seven locations (SV-60, SV-61, SV-63, SV-64, SV-65, SV-67 and SV-68). Samples were also collected in three locations (SV-57B, SV-58B and SV-61) and sampled for VOCs (Figure 3-2). The results of the analyses indicated that PCBs were not detected at a detection limit of 0.033 mg/kg and VOCs were not detected at a detection limit of 0.005 mg/kg [URS, 2004b].

3.2.3 Summary of Soil RI

The results of the soil assessments have been used to identify the areas of soil impacts and COCs at the Site. Previous assessments were conducted across the Site, including beneath the main building at the Site and the edge of the adjacent property to the northwest. Soil borings have extended as deep as 34.5 ft with soil samples taken to that depth. Chemical analyses of Site soils have included PCBs, VOCs, SVOCs and metals [URS, 2004b]. The results of the assessments indicate that soil in an area approximately 50 ft by 50 ft in size has been impacted by PCBs and VOCs, primarily TCE and PCE. Other VOCs were detected at lesser concentrations. This 50-foot by 50-foot area is located about 50 ft east of the main building beneath the current parking lot. Other areas of the Site are largely unaffected by soil impacts [URS, 2004a].

As stated in the Soil RI report, in some instances, PCBs were detected at depths greater than 10 ft bgs, including saturated soil at a depth of 30 ft. In these cases, the depth of PCB impact may be attributed to the presence of chlorinated solvents. The

solvents may have come in contact with PCBs already present in the soil, thereby increasing the mobility of the PCBs [URS, 2004a].

3.3 Soil Vapor Assessment Results

From 1986 to 1999, more than seventy soil vapor probes were advanced and sampled at the Site. Additional soil vapor assessment was conducted in 2005. The field assessments were conducted under the oversight of one or more representatives of the DTSC or the DHS [URS, 2004a]. The soil vapor sampling locations can be seen in Figure 3-2.

3.3.1 Initial Soil Vapor Assessment

A soil vapor survey was performed at the Site by TerraNext on 13 June 1997. The survey was conducted to assess the potential presence of VOCs in soil vapor [URS, 2004b]. Soil vapor samples were collected at seven locations, and a total of twelve soil vapor samples were collected and analyzed for VOCs. The soil vapor sampling and analysis was performed in accordance with the RWQCB Well Investigation Program (WIP) [URS, 2004b] and was overseen by DTSC.

The VOCs detected at the greatest concentrations were TCE and PCE. These constituents were detected in all twelve soil vapor samples. The concentrations of TCE and PCE detected in the soil vapor ranged from 0.098 milligrams per liter (mg/L) to 0.880 mg/L and from 0.012 mg/L to 0.940 mg/L, respectively. The highest concentrations detected during the initial soil vapor assessment were located in the area where the concentrations of VOCs in soil were the highest (SG-1 and SG-2) [URS, 2004b].

Concentrations of other VOCs ranged from 0.000042 mg/L to 0.24 mg/L, and included 1,1,1-TCA, cis-1,2-DCE, trans-1,2-DCE, chloroform, methylene chloride, vinyl chloride, and toluene, [URS, 2004b]. The analytical results of the soil vapor survey can be found in Table 3-10.

3.3.2 Additional Soil Vapor Assessments

D&M performed additional soil vapor assessments in three phases during November 1998, May 1999, and August 1999 [URS, 2004b].

3.3.2.1 November 1998 Sampling

Sixty soil vapor samples were collected from sixty boring locations (Figure 3-2) on 3, 4 and 5 November 1998. The soil vapor samples were analyzed for VOCs by a mobile laboratory [URS, 2004b]. The results can be found in Table 3-11.

The results of the November 1998 sampling and analysis indicated that elevated soil vapor concentrations were located in proximity to the previously identified area of impacted soil. Elevated soil vapor concentrations were also detected at locations SV-50, SV-52 and SV-53 on the adjacent property to the north (4150 Glencoe Ave.), and near the southeastern corner of the main building at the Site (locations SV-20 and SV-39) [URS, 2004b].

3.3.2.2 May 1999 Sampling

Additional soil sampling was performed on 23 May 1999 to evaluate soil vapor concentrations located under the northeastern and southeastern portions of the building, with some sampling locations located just outside of the building footprint. The sampling under the northeastern portion of the building was performed to evaluate soil vapor concentrations located under the former impregnation room and laboratory, while additional samples were located under the southeastern portion of the building to further evaluate soil vapor impacts that had previously been detected [URS, 2004b].

The soil vapor assessment consisted of soil vapor sampling at three locations beneath the main building (SV-57, SV-58 and SV-59) [URS, 2004b]. The results of the analysis indicated elevated concentrations of TCE and PCE. These results can be found in Table 3-12.

3.3.2.3 August 1999 Sampling

On 28 and 29 August 1999, additional soil vapor samples were collected from beneath the main building at the Site. The purpose of this sampling was to investigate additional areas under the building and to further assess the extent of elevated soil vapor concentrations in the southeastern corner of the building [URS, 2004b].

Soil vapor samples were located at nine locations (SV-57B, SV-58B, SB-60, SV-61, SV-63, SV-64, SV-65, SV-67 and SV-68) and analyzed for VOCs. The results of the analysis indicated that the levels of VOCs in soil vapor beneath the building rapidly decrease in a westerly direction from the southeast corner [URS, 2004b] and can be found in Table 3-13.

3.3.3 Building Indoor Air Quality Survey

The potential for soil vapor to impact the air quality inside the main building at the Site was evaluated during an air quality survey. The indoor air quality survey was conducted to assess concentrations of vapor-phase VOCs within the building occupied by the fitness center and the potential health risk to employees and members of the fitness center if VOCs were detected [URS, 2004b].

The indoor air quality survey sampling was conducted on 14 and 15 July 1999. A total of eight samples were collected at four sample locations during the two-day sampling effort. Three sampling locations were situated within the building, and one sampling location was situated outdoors in an upwind direction [URS, 2004b]. The sampling locations can be seen in Figure 3-3.

The samples were analyzed for VOCs according to USEPA Methods TO-14 and TO-15. The results of the analyses indicated that the majority of the target VOCs were not detected at concentrations greater than the laboratory detection limit. However, twelve compounds were detected at concentrations greater than the laboratory detection limit. Of these twelve compounds, nine chemicals were detected at concentrations very close to the laboratory detection limit and at similar or lesser

concentrations than those exhibited in the upwind air samples. The other three chemical constituents included acetone, toluene and PCE [URS, 2004b].

Acetone was detected at less than one-ten thousandth of the permissible exposure limit (PEL) set by the Occupational Safety and Health Administration (OSHA) and the odor threshold set by the USEPA. Toluene was detected at concentrations less than ambient levels for the Los Angeles area, as reported by the California Air Resources Board (except for one sample), and less than concentrations exhibited by upwind samples. PCE was detected at concentrations less than ambient levels for the Los Angeles area, as reported by the California Air Resources Board, except for one sample location, and less than one-ten thousandth of the PEL set by the OSHA [URS, 2004b].

These data were compared with OSHA PELs to determine whether current users of the main building are exposed to unacceptable risk. As documented in a report submitted to the DTSC, there is no unacceptable health risk to building occupants as the building is currently operated, which is with windows and doors open [URS, 2004b].

3.3.4 Pre-Remedial Design Soil Vapor Assessment

GeoSyntec performed additional soil vapor and soil sampling in May 2005 to obtain additional data for design of the remedy for the Site. Based on these results, additional soil vapor sampling was performed in June 2005 to assess the potential for long-term (chronic) health issues for receptors in a building south of the Site.

3.3.4.1 May 2005 Sampling

Sampling conducted in May 2005 focused on assessing whether there were additional concentrated areas of VOCs in soil at the Site, particularly beneath the former manufacturing building and in areas south of the building in the current parking lot. The field activities were conducted on 14 May 2005 and 15 May 2005 and included the sampling of twenty three locations (as shown on Figure 3-4). Four locations were co-located with previous soil vapor sampling points located in the fitness center building on Site. Soil vapor samples were collected from a depth of 5 ft bgs at each

location. Based on a comparison of May 2005 soil vapor samples with soil vapor samples collected several years ago, additional soil samples were collected from six locations (for a total of ten locations within the building). These additional sampling locations, along with the pre-existing data, completed a sampling grid of approximately 25 ft by 25 ft.

Soil samples also were collected from the four initial soil vapor sampling locations within the building (CSV-1 through CSV-4). Soil samples were collected from a depth of approximately 12 ft bgs and were analyzed by USEPA Method 8260B/5034 for VOCs. The soil vapor sample results can be found in Table 3-14, and the soil sample results are found in Table 3-15.

A similar approach was used south of the building to complete a rough sampling grid of 25 ft by 25 ft. A total of thirteen sampling points (CSV-11 through CSV-23) were completed south and southeast of the building (Figure 3-4). Soil vapor samples were collected from a depth of 5 ft bgs and analyzed for VOCs by USEPA Method 8260. The soil vapor sample results can be found in Table 3-14.

The results of the May 2005 sampling suggest that there is no additional source beneath the building, nor south or southwest of the previously characterized source zone. However, these results did indicate higher concentrations of PCE and TCE than previously detected in soil vapor south of the source zone. This increase is thought to be attributed to one or more of the following factors: natural variations in soil vapor concentrations as temperature and barometric pressure vary; changes in sampling protocols; or additional sources south of the 4144 Glencoe Avenue Site.

3.3.4.2 June 2005 Sampling

The higher concentrations of PCE and TCE found in soil vapor south of the source zone potentially could cause a long-term (chronic) health issue if the same concentrations were present south of the Site. To assess this possibility, GeoSyntec performed subslab sampling of soil vapor beneath the building located at 4208 Glencoe Avenue. Sampling protocol followed DTSC guidance [DTSC, December 2004]. Two soil vapor samples were collected beneath the 4208 Glencoe Avenue building on

16 June 2005. This sampling effort showed no significant short-term health effect. Results will be presented and discussed in a subsequent submittal to DTSC.

3.3.5 Summary of Soil Vapor Assessment

Soil vapor samples collected at the Site indicate that the primary VOCs contained in soil vapor are TCE and PCE, consistent with the results of soil sampling and analyses at the Site. Elevated concentrations of PCE and TCE were detected in soil vapor samples collected from under the southeastern portion of the main building. The soil vapor data generally support the hypothesis that the concentration of PCE and TCE in soil vapor decreases in a westerly direction under the main building and that the soil vapor present beneath the building is due to movement of soil vapor away from the source zone. Elsewhere on the Site, soil vapor also appears to decrease away from the source zone, further supporting the hypothesis that the source zone is the main contributor to soil vapor throughout the Site.

The risk assessment [GeoSyntec 2004] concluded that there was no significant risk to downgradient receptors based upon soil vapor results available at the time of the risk assessment. The results of the June 2005 sampling will be used to re-evaluate risk to downgradient receptors, and a discussion of the results will be presented in a separate document.

The results of the indoor air sampling at the Site (in the main building) indicate that VOCs were detected at concentrations very close to detection limits and at concentrations similar or lower than upwind air samples taken off Site. The air monitoring results indicate that VOCs in soil vapor beneath the building do not pose a significant health risk to workers or visitors to the fitness center under current operating conditions [URS, 2004b].

3.4 Groundwater Assessment Results

The Groundwater RI was conducted to assess Site hydrostratigraphy and the lateral and vertical extent of COCs in groundwater beneath and downgradient of the Site. The Groundwater RI was conducted in a phased approach, with the scope of

successive phases based on the findings of preceding phase. The Groundwater RI included the collection of samples from more than thirty temporary well points advanced with CPT soundings, from four groundwater monitoring wells in the A/B aquifer system, and from three groundwater monitoring wells in Aquifer C (Figure 3-5). A summary of the CPT soundings, including surface elevations, target depth, final depth, and depth of groundwater samples collected, can be found in Table 3-15.

3.4.1 Summary of Hydrostratigraphy

The results for the Groundwater RI indicate that groundwater occurs 19 to 21 ft bgs (approximately 2 ft above mean sea level). Groundwater first occurs in Aquifer A, which consists mainly of sand and gravelly sand and appears to range from 5 to 10 ft in thickness beneath the Site. Groundwater monitoring wells in Aquifer A indicate groundwater flows toward the south-southwest at a gradient that ranges from approximately 0.0005 to 0.001 foot/foot [URS, 2004a].

Aquifer B is situated below Aquifer A and is separated from Aquifer A by several low-permeability layers that appear to be discontinuous. Aquifer B consists of mainly sand, gravel, and cobbles and appears to range from 15 to 20 ft in thickness. Available data indicate that groundwater in Aquifers A and B is in hydraulic communication, and it is assumed that the flow direction and gradient of groundwater in Aquifer B is the same as Aquifer A.

Aquifer C underlies Aquifer B and is separated from Aquifer B by a low-permeability layer that appears to be continuous in the immediate Site vicinity. Aquifer C, which consists of fine to medium-grained sand, is approximately 200 ft thick in the Site vicinity. The depth to its base is approximately 250 to 300 ft bgs.

Groundwater monitoring wells in Aquifer C indicate groundwater flows toward the south at a gradient of approximately 0.001 foot/foot [URS, 2004a].

3.4.2 Contaminants of Concern

Site evaluation began in 1986, following initial state DHS (predecessor to DTSC) inquiries and requests for site assessment. In 1987, four 2-inch diameter,

30-foot deep groundwater monitoring wells were installed on Site in Aquifer A. Previous investigators sampled groundwater from these four on-site wells on two occasions, once in April 1987 and once in November 1996. Based on the results of these two sampling events, the most prevalent COCs detected in groundwater were TCE, PCE and PCBs. However, it was later determined that elevated concentrations of PCBs detected in groundwater were a result of analyzing turbid groundwater samples and not actual concentrations of PCBs dissolved in groundwater. It was determined that PCBs were likely mobilized by chlorinated compounds as they migrated through the vadose zone. Testing of filtered and unfiltered groundwater samples indicated that a majority of the PCBs in the saturated zone were adsorbed onto soil particles and not dissolved into groundwater. In confirmatory samples, PCBs were not detected in any of the groundwater samples collected from Aquifers A or B during the Groundwater RI [URS, 2004a].

The locations of the monitoring wells and the concentration and distribution of chemical constituents detected during the 1987 and 1996 sampling events are presented on Figure 3-6. The groundwater sampling results are consistent with the results of the previous soil and soil vapor assessments discussed in Sections 3.2 and 3.3, respectively [URS, 2004b].

3.4.2.1 Assessment of Vertical Extent of Impacts

The interpretation of the subsurface hydrostratigraphy and groundwater quality (nature and extent of COCs) was based on depth discrete sampling that was performed in wells and temporary well points on and in the Site vicinity during the groundwater RI. The initial phase of the groundwater RI consisted of advancing and sampling eight CPT soundings, six on Site and two off Site on Glencoe Avenue. Results of the sampling and analysis indicate that deeper samples contained higher concentrations of PCE and TCE than shallower samples.

To conduct a vertical profile through the A/B aquifer system, groundwater samples were collected from the base of Aquifer A and from Aquifer B. The results indicated that the highest concentrations of PCE and TCE detected occurred in Aquifer B (41 mg/L of PCE and 140 mg/L of TCE) at a location southeast of the initial CPT soundings, along the southern border of the Site.

To assess the groundwater zone below the A/B aquifer system for the presence of VOCs, three groundwater monitoring wells (MWC-1 through MWC-3) were installed in Aquifer C (Figure 3-5). Samples did not contain VOCs at concentrations above their respective detection limits, indicating that groundwater within Aquifer C has not been impacted by the Site.

3.4.2.2 Assessment of Lateral Extent of Impacts

CPT soundings were advanced from the source area to approximately 1,500 ft downgradient of the Site (near the Marina Expressway) to assess the downgradient and cross gradient extent of VOC-impacted groundwater in the A/B aquifer system. Groundwater samples were collected at multiple depths and analyzed for VOCs by USEPA Method 8260B. Results of the testing indicated the narrow plume of total chlorinated compounds that is shown on Figure 3-7. The plume is approximately 500 ft wide and 2,000 ft long, as defined by its 0.1 mg/L isoconcentration line. PCE and TCE concentrations at the southern extent of the total chlorinated compound plume in Aquifer A were 0.062 mg/L and 0.17 mg/L, respectively, and 0.03 mg/L and 0.06 mg/L, in Aquifer B. These data imply that the impacts in the downgradient portion of the plume are greater in shallower Aquifer A. The estimated southern extent of total chlorinated compound impacts occurs about 2,000 ft south of the source area, based on the 0.1 mg/L isoconcentration line.

3.4.3 Natural Attenuation Results

Natural attenuation refers to naturally occurring processes in soil and groundwater environments that act without human intervention to reduce the mass, toxicity, mobility, volume, or concentration of contaminants. These *in situ* processes include biodegradation; dispersion; dilution; sorption; volatilization; and chemical or biological stabilization, transformation, or destruction of contaminants [USEPA, 1999]. Destructive mechanisms, such as biodegradation, are key processes in the successful application of monitored natural attenuation because they provide an active component to reduce the mass of contaminants over time.

The conceptual understanding of the Site pertinent to the evaluation of natural attenuation includes the source zone characterization and the downgradient dissolved-phase groundwater contamination. As previously discussed, residual dense non-aqueous-phase liquid (DNAPL) has been detected on Site in a distribution that is relatively restricted laterally near the southeast corner of the building and appears to have historically migrated down below the water table, but does not appear to have migrated into the underlying Aquifer C. Furthermore, the distribution and disposition of the DNAPL suggest that it resides at or below residual saturation levels and does not appear to be actively migrating.

To understand whether natural attenuation can be incorporated into the Site remedy, Site data were evaluated following USEPA protocol outlined in *Technical Protocol for Evaluating Natural Attenuation of Chlorinate Solvents in Ground Water* [USEPA, 1998] and the USEPA Office of Solid Waste and Emergency Response (OSWER) Directive 9200.4-17P titled *Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites* [USEPA, 1999]. Both the technical protocol and the OSWER Directive present three lines of evidence which need to be evaluated for a potential monitored natural attenuation (MNA) remedy. These three lines of evidence are as follows:

1. **Historical groundwater and/or soil chemistry data** that demonstrate a clear and meaningful trend of decreasing contaminant mass and/or concentration over time at appropriate monitoring or sampling points. (In the case of a groundwater plume, decreasing concentrations should not be solely the result of plume migration.)
2. **Hydrogeologic and geochemical data** that can be used to demonstrate indirectly the type(s) of natural attenuation processes active at the Site, and the rate at which such processes will reduce contaminant concentrations to required levels. For example, characterization data may be used to quantify the rates of biological degradation processes occurring at the Site.
3. **Data from field or microcosm studies** conducted in or with actual contaminated Site media that directly demonstrate the occurrence of a particular natural attenuation process at the Site and its ability to

degrade the contaminants of concern (typically used to demonstrate biological degradation processes).

The first line of evidence alone is adequate to support a decision to use MNA. If historical data are deemed inadequate, data characterizing the nature and rates of natural attenuation processes at the Site (second line of evidence) should be provided. Where these data also are deemed inadequate, field or microcosm study data (third line of evidence) should be provided.

Based on time-series data collected from groundwater monitoring wells (Figure 3-6), PCE and TCE concentrations have remained stable or decreased since 1998 (Figures 3-8 through 3-11). This is an indication that advective transport mechanisms are balanced or outweighed by attenuative mechanisms. The natural oxidation state of the aquifer is believed to be generally aerobic; however, the dissolved phase plume is postulated to be stable at this time, which is attributed to the combined effect of operations being stopped at the facility, source reduction through natural processes, and VOC degradation. Degradation of VOCs is shown by the presence of daughter products for parent compounds such as PCE and TCE. These data support the use of a natural attenuation remedial strategy for groundwater at the Site.

3.4.4 Groundwater Monitoring Program

A quarterly groundwater monitoring program was conducted in the four on-site monitoring wells from March 1998 to July 2002 (seventeen consecutive quarters). Subsequent to July 2002, the sampling frequency was decreased with DTSC concurrence from quarterly to annually.

The groundwater monitoring procedures include measuring depth to groundwater, total depth of each well, purging the wells of at least three well volumes, and low flow sampling of the wells. Low flow sampling is employed at the Site to mitigate disturbance of the formation surrounding the well that could potentially result in turbid groundwater samples, which has been found to affect PCB results in groundwater negatively. Groundwater samples are submitted to a state-certified analytical testing laboratory for the following analyses:

- EPA Method 8260 or equivalent for VOCs;
- EPA Method 8270 or equivalent for SVOCs;
- EPA Method 8082 or equivalent for PCBs;
- EPA Method 6010/7060/7470 or equivalent for metals; and
- EPA Method 218.6 or equivalent for hexavalent chromium.

Sampling of the A/B aquifer system ceased in 2003, and in August 2003, three groundwater monitoring wells (MWC-1, MWC-2, MWC-3) were installed into Aquifer C to assess the next deepest groundwater zone below the A/B Aquifer system for the presence of VOCs [URS, 2004b]. The first groundwater sampling event for these three wells (MWC-1, MWC-2, and MWC-3) occurred on 19 September 2003, and they are currently sampled on a quarterly basis. Groundwater monitoring procedures are the same as those listed above; however, samples from the Aquifer C wells are analyzed for the following:

- EPA Method 8260B for VOCs;
- EPA Method 300.0 for chloride; and
- EPA Method 160.1 for total dissolved solids (TDS).

The results of the analyses for Wells MWC-1, MWC-2, and MWC-3 have shown non-detectable concentrations for all analytes since the commencement of Aquifer C sampling.

3.5 Source Zone Assessment Results

The results of the RI show that detected concentrations of PCE and TCE in groundwater represent more than twenty-five percent of the effective solubility for PCE and fifteen percent for TCE, which are strong indicators of the presence of DNAPL. Based on elevated concentrations of TCE and PCE at the Site, a conclusion was drawn in the Groundwater RI that there is the potential for DNAPL to occur in the A/B aquifer system [URS, 2004a].

Through meetings involving the DTSC, it was determined that additional Site activities should be conducted to assess the possible presence and location of

DNAPL. Through this focused pre-design assessment, GeoSyntec expected to be able to evaluate more thoroughly the applicability of remedial technologies to potential DNAPL issues at the Site. Generally, a small concentrated zone of DNAPL can be treated differently and more efficiently than a large dispersed zone of DNAPL.

Accordingly, additional Site investigation activities were completed in July 2004 through August 2004 to delineate the zone in which DNAPL may occur at the Site. CPT soundings were advanced to determine lithology and PCE/TCE concentrations in soil and groundwater. A membrane interface probe (MIP) was deployed at fourteen locations to determine whether DNAPL was present, and if so, at what thickness and concentrations. In addition, three continuously cored boreholes were advanced from which soil and groundwater grab samples were collected and analyzed for indications of the presence of DNAPL. The soil and groundwater analytical data are summarized in Appendix A.

The results of this work showed indications of DNAPL within the limited zone shown in Figure 3-12. This zone, which includes both vadose zone soils above the groundwater table as well as groundwater in the A/B aquifer system, is referred to hereinafter in this FS Report as the “source zone.” The “source zone” is defined as the region in which DNAPL may be present as a separate phase, either as randomly distributed sub-zones at residual saturations or as pools of accumulation above confining units and includes the volume of the aquifer that has had contact with free-phase DNAPL at one time, as well as overlying vadose soils which may contain DNAPL. Contamination of groundwater is believed to occur as a result of dissolution of DNAPL within the source zone and subsequent migration of PCE and TCE from the source zone as dissolved contaminants in groundwater.

GeoSyntec notes that there has been significant research and discussion at both the national and international level regarding the potential for cleanup of DNAPL at contaminated sites. This research and discussion occurred because of the broad experience that has now been developed in dealing with DNAPL sites. A general finding of this experience is that DNAPL, when it occurs at a site, cannot be completely removed through typical soil and groundwater remediation techniques. USEPA commissioned a panel to review available DNAPL site data and develop alternate cleanup and risk management strategies. The conclusions of this panel’s work were published by USEPA [USEPA, 2003]. The panel concluded that DNAPL cleanup

strategies generally should acknowledge the technical impracticability that precludes removal of all DNAPL at a site and the associated impracticability in meeting numeric cleanup standards for soil and groundwater impacted by DNAPL. According to USEPA, cleanup strategies instead should focus on practicable reduction of DNAPLs, with risk management of residuals through engineered and/or institutional controls and monitoring [USEPA, 2003]. This strategy is reflected in the RAOs for the Site, which are discussed in Section 4 of this FS Report.

Risk and liability management, consistent with regulatory compliance requirements, could involve remediation of the source zone, as well as management of the dissolved plume. The DNAPL mass apparently is present only in the dissolved or sorbed phases or diffused into the matrix in fractured systems. Several in-situ technologies are available which can achieve substantial DNAPL source depletion either by extraction or destruction [USEPA, 2003]. These technologies will be discussed in Section 5 of this FS Report.

4. REMEDIAL ACTION OBJECTIVES AND CLEANUP CRITERIA

4.1 General

The development of remedial action objectives (RAOs) is required by USEPA guidance as part of the FS process [USEPA, 1988]. RAOs consist of goals specific to various media for protecting human health and the environment. RAOs generally are expressed in terms of contaminant levels and routes of exposure, so that they can be achieved through a combination of reducing contaminant levels and/or reducing exposure to contaminants. The process of developing RAOs for the Site depends upon the assessment of risk to identified receptors from various contaminants present at the Site. This section describes the following for the Site:

Chemicals of Potential Concern;

- Risk Assessment;
- Chemicals of Concern; and
- Remedial Action Objectives.

4.2 Chemicals of Potential Concern

The chemicals of potential concern (COPCs) for the Site were developed and discussed in the hazard identification section of the risk assessment (RA) [GeoSyntec 2004]. USEPA guidance states that the list of chemicals should include all chemicals that were:

- positively detected in at least one sample;
- detected above levels of the same chemicals found in associated blank samples;
- tentatively identified, but may be associated with the Site based on historical information;
- transformation products of detected chemicals; and
- detected above naturally occurring levels (background).

During the RA, those contaminants posing a potential risk to receptors at the Site were identified as COPCs and can be found in Tables 4-1 through 4-3 for soil, soil vapor, and groundwater, respectively.

4.3 Risk Assessment

An RA report was prepared to evaluate potential health risks associated with chemicals detected in soil, soil vapor, and groundwater at the Site [GeoSyntec, 2004]. The results of the RA were used to identify chemicals that may pose a risk to current and/or future receptors at the Site through identified exposure routes and to provide information for remedial planning. The overall approach used in the RA was based on USEPA guidance documents [USEPA, 1989; 1991ab; 1997a; 2000; 2001a and b; 2002] and Cal-EPA guidance documents [Cal-EPA 1997; 1999; 2000]. The RA was submitted to the DTSC and was approved by the DTSC in a letter dated 26 May 2004 [DTSC, 2004].

4.3.1 Selection of Receptors

Potential receptors for on-site and off-site exposure scenarios were identified in the RA. The receptors were determined by evaluating the current and future land use of the Site. The following potential receptors were evaluated in the RA:

- Current On-site Landscaper and Utility Worker;
- Current Off-site Landscaper and Utility Worker;
- Current Off-site Resident;
- Future On-site Resident; and
- Future On-site Landscaper and Utility Worker.

4.3.2 Exposure Pathways and Scenarios

The RA addressed potential exposures to on-site landscapers and utility workers, off-site commercial workers, and off-site residents under a current exposure scenario, as well as to hypothetical future on-site residents and hypothetical future on-site landscapers and utility workers. The specific future use scenario assessed a mixed-use development described in Sec. 4.6 below. Potential exposures to chemicals detected in shallow soils (from 0 to 10 ft bgs) were evaluated for the direct contact pathways, as well as inhalation of outdoor air vapors and fugitive dust. The exposure pathways and scenarios for each identified receptor at the Site are discussed below.

4.3.2.1 Current On-site Landscapers and Utility Workers

An air quality survey was conducted by Dames & Moore (now URS Corporation) in 1999 to determine if elevated levels of VOCs were present in the building on Site, occupied by a fitness center, may have originated from subsurface contamination, and whether these levels would pose an unacceptable health risk to workers and members of the health club. Potential exposures to indoor air vapors for workers and users of the on-site fitness center were considered negligible and are discussed in Section 3 of this FS Report [Dames & Moore, 1999].

4.3.2.2 Current Off-site Commercial Workers

Because off-site commercial buildings currently overlie the groundwater plume, there exists a potential for exposures to indoor air vapors volatilizing from the subsurface. Potential indoor air exposures to off-site commercial workers therefore were evaluated quantitatively in the RA, assuming a non-residential space is located in a subterranean parking garage [GeoSyntec, 2004]. Subsequent to the RA, subslab sampling of soil vapor was conducted beneath the building located at 4208 Glencoe Avenue in June 2005, as discussed in Section 3.3.4.2. Results from this sampling effort will be presented and discussed in a subsequent submittal to DTSC.

4.3.2.3 Current Off-site Residents

During a reconnaissance of the land use within the perimeter of the groundwater plume, an apartment building was identified downgradient from the Site. Therefore, off-site exposures were evaluated quantitatively in the RA for inhalation of vapors volatilizing from groundwater into indoor air, assuming upper floor residences [GeoSyntec, 2004].

4.3.2.4 Hypothetical Future On-site Residents

Future residential exposures may occur if the Site becomes redeveloped with a new building that includes first floor non-residential use and upper floor residential use. Therefore, inhalation of volatiles in indoor air from soil, soil vapor and groundwater were evaluated quantitatively for hypothetical future residents living on the Site.

4.3.2.5 Hypothetical Future On-site Landscapers and Utility Workers

Potential future use of the property may include commercial buildings or multi-floor residential use. It is anticipated that the majority of the Site will be covered by pavement and/or buildings. A minimal amount of landscaping would be expected, which reduces the potential for exposure to soils. However, exposures may occur during maintenance activities (e.g., landscaping) and while constructing/inspecting utility trenches; therefore, potential exposures to a future landscaper and utility worker operating at the Site were evaluated quantitatively in the RA report [GeoSyntec, 2004].

4.3.2.6 Ecological Evaluation

A screening-level ecological assessment was conducted to evaluate the potential pathway of Site related chemicals migrating to nearby surface water bodies. The maximum detected concentrations of chemicals in the farthest downgradient CPT locations were compared to risk-based ecological screening values for each chemical detected in groundwater sampling [GeoSyntec, 2004].

4.3.3 Results for Current Receptors

The results of the RA indicate that there is no unacceptable risk for current on-site receptors, which include landscapers and utility workers. Cancer risks and noncancer hazards for current on-site landscapers and utility workers potentially exposed to indoor air vapors in the existing fitness center were not evaluated due to the prior evaluation of indoor air samples collected in July 1999 that determined no adverse impact from subsurface contamination. Cancer risks and noncancer hazards for current off-site commercial workers potentially exposed to indoor air vapors in a commercial establishment located in a subterranean parking garage were evaluated and found to be below the target health goals of 1×10^{-5} and 1.0, respectively. Estimated cancer risks and noncancer hazards for current off-site residents potentially exposed to indoor air vapors in a first-floor residence above a subterranean parking garage were below 1×10^{-6} and 1.0, respectively [GeoSyntec, 2004].

4.3.4 Results for Hypothetical Future Receptors

The results of the RA indicate that chlorinated VOCs and PCBs may pose an unacceptable health risk (greater than 1×10^{-6}) under a future, upper-floor residential use scenario. In addition, PCE and PCBs may pose an unacceptable health risk (greater than 1×10^{-5}) to future on-site landscapers and utility workers. Therefore, the following potential future exposure pathways would require mitigation depending on the future land use of the Site:

- Inhalation of indoor air vapors from on-site soils, soil vapor, and groundwater (hypothetical future residents, landscapers, utility workers, and possibly off-site commercial workers); and
- Incidental ingestion and dermal contact with on-site shallow soils and inhalation of outdoor air fugitive dust/vapors (hypothetical future landscaper and utility workers) [GeoSyntec, 2004].

4.3.5 Results of Ecological Evaluation

The results of the RA screening-level ecological assessment show that groundwater chemical concentrations were below the chronic screening criteria. This indicates that the current chemical concentrations at the leading edge of the groundwater plume would not adversely impact aquatic receptors [GeoSyntec, 2004]. Therefore, there is currently no unacceptable ecological risk, as agreed by the DTSC upon approval of the RA.

4.4 Chemicals of Concern

Following completion of the RA, primary risk driving chemicals were identified from the list of COPCs (see Section 4.2) as chemicals of concern (COCs). These chemicals were identified as primary risk drivers because they are the most ubiquitous chemicals throughout the Site and because they are co-located with a majority of the COPCs (i.e., the risk associated with the COCs would encompass the COPCs). Specific COCs for the Site are the following:

- Soil COCs include PCBs, TCE and PCE;
- Soil vapor COCs include TCE and PCE; and
- Groundwater COCs include TCE and PCE.

As discussed in Section 2.3, PCBs (primarily Arochlors 1248, 1254, and 1260) and TCE were used in CDE Site operations. However, CDE reportedly has no record of using PCE in any of its Site processes [URS, 2004a].

The results of the RA indicate that if commercial or high-rise residential land use is considered for the future development of the Site or if exposure to soils via landscaping or utility trench activities may occur in the future, then remedial options should be considered for areas of the Site where elevated concentrations of COCs are detected in shallow soils and groundwater [GeoSyntec, 2004].

4.5 Remedial Action Objectives

RAOs are goals specific to various media and apply to those media that have been identified as posing an unacceptable risk based on the RA work performed at the Site. RAOs are identified below for on-site soils, source zone, and groundwater. These media will be considered for remedial action in this FS Report. Based on the previous RI investigations and the RA, there is no significant risk for current Site uses, therefore the RAOs are based on future hypothetical receptors. However, off-site risk will be re-evaluated based on the results of the June 2005 subslab sampling, and will be discussed in a subsequent document.

The RAOs developed for the Site consider the presence of DNAPL in the source zone, as described in Section 3.5. Also as discussed in Section 3.5, GeoSyntec notes that there has been significant research and discussion at both the national and international level regarding the potential for cleanup of DNAPL at contaminated sites. This research and discussion occurred because of the broad experience that has now been developed in dealing with DNAPL sites. A general finding of this experience is that DNAPL, when it occurs at a site, cannot be completely removed through typical soil and groundwater remediation techniques. USEPA commissioned a panel to review available DNAPL site data and develop alternate cleanup and risk management strategies. The conclusions of this panel's work were published by USEPA [USEPA, 2003]. The panel concluded that DNAPL cleanup strategies generally should acknowledge the technical impracticability that precludes removal of all DNAPL at a site and the associated impracticability in meeting numeric cleanup standards for soil and groundwater impacted by DNAPL. According to USEPA, cleanup strategies instead should focus on practicable reduction of DNAPLs, with appropriate risk management of residuals through engineered and/or institutional controls and monitoring [USEPA, 2003]. This strategy is reflected in the RAOs for the Site, which follow.

One RAO specifically addresses soils at the Site:

- Reduce risk from ingestion, inhalation, and dermal contact with soils to risk levels of $<1 \times 10^{-5}$ for future landscapers and utility workers. In addition, reduce risk so that the noncancer hazard index (HI) is <1 .

Other RAOs are focused on the source zone and groundwater at the Site, along with the soil vapor that is associated with the source zone:

- Reduce VOCs through application of appropriate in-situ remedial technology in source zone of known high VOC concentrations.
- Provide adequate controls to reduce indoor air exposure to chlorinated VOC soil vapor concentrations to risk levels of $<1 \times 10^{-6}$ for future on-site residents. In addition, reduce risk so that the noncancer HI is <1 .
- Manage the residual dissolved phase plume to limit future risk to off-site receptors: maintain risk levels of $<1 \times 10^{-6}$ for future off-site residents, and $<1 \times 10^{-5}$ for future landscapers and utility workers; non-cancer hazard index of <1 .
- Manage residual dissolved phase plume to demonstrate acceptable future risk to on-site receptors: risk levels of 1×10^{-6} for future on-site residents and 1×10^{-5} for future landscapers and utility workers.
- Manage the residual dissolved phase plume so that chemical concentrations continue to exhibit insignificant risk to ecological receptors downgradient of the Site.
- Manage the residual dissolved phase plume so that the deep aquifer (Aquifer C) beneath the Site is protected.

4.6 Future Site Use

Land use at the Site and in the vicinity of the Site is in transition from light industrial and commercial use to mixed-use, consisting of mixed commercial / non-residential and residential use. The redevelopment trend has accelerated dramatically in 2004-2005, with many demolition and redevelopment projects underway on Glencoe Avenue and on Redwood Avenue between Maxella Avenue to the south and W. Washington Boulevard to the north. Although the existing on-site building is operated as a fitness center, the future use of the Site is anticipated to reflect the redevelopment

trend in the area and include a new building with first floor non-residential use and upper floor residential use. New buildings associated with the anticipated future use of the property are expected to be constructed either slab on grade or with underground parking. This use is similar to the other properties in the Site vicinity and, from a risk perspective, represents a conservative hypothetical future use scenario.

The remedial alternatives in this FS Report will include remedial measures that will accommodate this conservative hypothetical future use scenario.

4.7 Cleanup Criteria

The cleanup criteria for the Site were developed with consideration given to the following factors:

- A hypothetical future use scenario which includes a building anywhere on the Site, configured to accommodate first floor non-residential use and upper floor residential use;
- Remedial action objectives; and
- Potential Site health risk.

The cleanup criteria, shown in Table 4-4, were developed for each of the three COCs identified in Section 4.4 (i.e., TCE, PCE and PCBs). Cleanup criteria either are numeric goals to be achieved through remediation or are non-numeric performance-based criteria. The cleanup criteria shown in Table 4-4 will be used subsequently in this FS Report to guide the selection and screening of remedial technologies and the development and detailed analysis of remedial alternatives. A discussion of the development of cleanup criteria follows.

4.7.1 Soil Cleanup Criteria

4.7.1.1 Chlorinated VOCs

As was summarized in Section 3, chlorinated VOCs in soil largely are limited to the source zone. The cleanup of chlorinated VOCs within the source zone is discussed below in Section 4.7.2.1. Outside of the source zone, a shallow soil cleanup is described below in Section 4.7.1.2. This shallow soil cleanup, which is focused on PCBs, also will remove VOCs that may be present in these soils although the VOCs in these shallow soils are not thought to pose a significant risk to receptors.

The potential for VOCs to impact groundwater outside of the source zone has been addressed through several stages of the RI. It also was the subject of the May 2005 and June 2005 sampling events described in Sections 3.3.4.1 and 3.3.4.2, respectively. Currently, outside the source zone no VOC contaminant mass was identified that is believed to pose a threat to groundwater. Therefore, there is no specific cleanup criterion focused on VOCs outside of the source zone. The cleanup criterion will be re-evaluated for off-site commercial use based on the results of the June 2005 sampling, and discussed in a separate submittal to DTSC.

4.7.1.2 PCBs

The basis of the cleanup criteria shown in Table 4-4 for PCBs in shallow soil is presented in a memorandum prepared by GeoSyntec (Exhibit 1). The memorandum explains that cleanup of shallow soils to a concentration of 17 mg/kg, and to a maximum depth of ten ft bgs, will allow the risk-based goal of 1×10^{-5} cancer risk to be achieved for future hypothetical receptors at the Site (i.e., landscapers and utility workers). A Site-wide average concentration of 6.4 mg/kg results from the cleanup of shallow soils containing greater than a concentration of 17 mg/kg PCBs. The area of the Site that is affected by this cleanup is discussed in Section 6 of this FS Report.

4.7.2 Source Zone Cleanup Criteria

4.7.2.1 Chlorinated VOCs

The basis of the risk-based concentrations shown in Table 4-4 for PCE and TCE in soil vapor associated with the source zone is presented in a memorandum prepared by GeoSyntec (Exhibit 2). The soil vapor risk-based concentrations shown in the Exhibit 2 memo were developed for the hypothetical future building assuming that engineered controls (vapor control system) would be required and included in the building construction. The installation of a vapor control system is typical for mixed-use building construction in the area of the Site, and indeed throughout Southern California. For comparison purposes, Exhibit 2 also presents soil vapor concentrations that would be protective of building occupants if no vapor control system were to be included in building construction.

The cleanup criteria for VOCs in the source zone are performance-based. The criteria call for application of in-situ technology in VOC source zone to destroy contaminants to the limit of the technology. The criteria also call for the inclusion of adequate engineered controls to mitigate exposure to chlorinated VOC soil vapor concentrations to risk levels of $<10^{-6}$ for future on-site residents and $<10^{-5}$ for future landscapers and utility workers. In addition, the noncancer hazard index will be reduced to <1 (see Exhibit 2).

The source zone and cleanup approach are discussed in Section 6 of this FS Report. A soil vapor survey will be performed at the completion of the remedy. Based on the results of this survey, post-remedy cumulative risk due to soil vapor will be assessed, and an assessment will be made regarding how the vapor control system will be maintained. Any such maintenance requirement will be included in an institutional control. It is believed that soil vapors at the Site emanate from the source zone. GeoSyntec expects that the soil vapor concentrations throughout the Site will decline after the remedy is complete.

4.7.2.2 PCBs

Within the source zone, a soil column containing high-concentration PCBs will be excavated and removed. The goal of this remedial step will be to remove PCB mass from the Site. There is no specific cleanup criterion developed for PCBs within the soil column, since the goal of the soil column excavation is to accomplish mass removal.

4.7.3 Groundwater Cleanup Criteria

4.7.3.1 Chlorinated VOCs

The cleanup criteria for the groundwater plume are based on the limits of the performance of the technology. As was discussed previously in this FS Report, the origin of the groundwater contamination is DNAPL within the source zone. The cleanup of the source zone, described above, will destroy and/or significantly reduce DNAPL within this source zone. Groundwater contaminant concentrations are expected to decline once the remediation is complete. The cleanup criteria therefore call for continued monitoring of the dissolved groundwater plume to demonstrate acceptable future risk to off-site receptors: risk levels of $<10^{-6}$ for future off-site residents, and risk levels of $<10^{-5}$ for future landscapers and utility workers; noncancer hazard index of <1 ; and continue meeting ecological risk standards downgradient of the Site. In addition, the cleanup criteria require that the deep aquifer, which has shown no evidence of impact from Site contaminants, continue to be protected.

Ultimately, the goal of the groundwater cleanup will be to reach MCLs in groundwater. That goal may be achievable over an indefinite time, through the continued action of natural attenuation mechanisms that are discussed in Section 3.4.3.

4.7.3.2 PCBs

PCBs are not a groundwater COC and have not been detected in groundwater wells downgradient of the Site. There is no cleanup criterion required nor developed for PCBs in groundwater.

5. TECHNOLOGY IDENTIFICATION AND SCREENING

5.1 General

General response actions (GRAs) describe remedial actions that will address RAOs and achieve cleanup criteria for hypothetical future receptors that may be exposed to soil, source zone, and groundwater contaminants. This section provides a discussion of GRAs and also provides identification of potential remedial technology types and specific technologies. The section also provides a screening of technologies to identify those that will be combined into remedial alternatives in Section 6 of this FS Report.

5.2 General Response Actions

Specific GRAs identified for on-site soil, source zone, and groundwater include the following:

- No Action;
- Remediate or remove soils that present potential ingestion and/or dermal contact risk;
- Remove identified sources of soil vapor contamination in vadose zone and saturated zone soils associated with the source zone;
- Reduce concentrations of COCs that present a potential inhalation risk and that contribute to the groundwater contamination;
- Monitor groundwater; and
- Implement institutional controls to restrict access to on-site groundwater and to control and manage risk associated with future mixed-use redevelopment.

5.3 **Technology Identification and Screening**

In accordance with USEPA guidance, potential remedial technology types and specific technologies that can be used to implement the GRAs were identified and then screened to assess their effectiveness, implementability, and cost with regard to the COCs: chlorinated VOCs and PCBs. In Table 5-1, technologies for on-site soils, source zone and groundwater are listed. Technologies generally can be grouped into two categories: in-situ and ex-situ. As required by USEPA guidance, “No Action” has been retained for evaluation. Also evaluated are institutional controls, such as deed restrictions, and engineered controls, such as vapor control systems. The technologies identified for remediation listed in Table 5-1 follow:

- No Action;
- Institutional controls (deed restriction);
- Engineered controls;
- Enhanced in-situ bioremediation;
- Phytoremediation;
- Electrical resistive heating;
- Soil vapor extraction;
- In-situ chemical oxidation;
- Surfactant flushing;
- Chemical stabilization;
- Air sparging;
- Permeable reactive barrier;
- Ex-situ treatment (pump and treat)
- Capping;
- Slurry or sheet pile wall;
- Excavation;
- Low temperature thermal desorption; and
- Incineration.

In accordance with USEPA guidance, Table 5-1 also includes a screening of the soil technology types and specific technologies based on their relative effectiveness, implementability, and cost. This screening provides the rationale behind the decision to

retain or eliminate each technology type. The following technology types were retained after screening for further evaluation:

- No action (as required by USEPA guidance);
- Institutional controls;
- Engineered controls;
- In-situ physical;
- In-situ chemical;
- Containment;
- Capping; and
- Excavation.

A summary of technologies retained is presented in Table 5-2. Each retained technology will be integrated into one or more preliminary remedial alternatives, described in Section 6.

Due to the application and design of thermal remediation systems, electrical resistive heating would be applied to both the vadose and saturated zones of the subsurface. Therefore, in the remainder of this FS Report, electrical resistive heating will be discussed in the context of a source zone / groundwater remedial alternative.

6. DEVELOPMENT OF REMEDIAL ALTERNATIVES

6.1 General

In this section, preliminary remedial alternatives for the Site are assembled from those technologies that remain after screening in Section 5. These preliminary remedial alternatives are then screened to identify final remedial alternatives. A conceptual description of each final remedial alternative is then developed.

This section provides the following:

- Assembly of Preliminary Remedial Alternatives;
- Screening of Preliminary Remedial Alternatives;
- In-Situ Chemical Oxidation Treatability Study; and
- Final Remedial Alternative Descriptions.

6.2 Assembly of Preliminary Remedial Alternatives

Preliminary remedial alternatives are presented in Table 6-1. The list of nine preliminary remedial alternatives includes one no-action alternative (Alternative 1), plus eight alternatives consisting of two soil remedial alternative components combined with each of four source zone / groundwater remedial alternative components. Each preliminary remedial alternative includes a remedial approach that accommodates the hypothetical future use scenario described in Section 4, which includes a building anywhere on the Site, configured to accommodate first floor commercial / non-residential use and upper floor residential use.

Some key assumptions were used to reduce all possible combinations of technologies into the set of preliminary remedial alternatives discussed in this section. These assumptions include the following:

- Two contaminated soil types, soils including VOCs, and soils including PCBs are considered in assembling alternatives. The COCs within the two contaminated soil types may be co-located at the Site, particularly in the source zone.

- The source zone / groundwater alternatives will include a discussion of source zone remediation in the vadose zone as well as in the saturated zone).

Each preliminary remedial alternative listed in Table 6-1 is a complete alternative for the Site. Each alternative includes a soil component as well as a source zone / groundwater component that will address the RAOs listed in Sections 4.5 and the cleanup criteria listed in Section 4.7 and Table 4-4 of this FS Report.

6.3 Screening of Preliminary Remedial Alternatives

6.3.1 General

Table 6-1 presents the seven preliminary remedial alternatives that were retained for evaluation. These include a range of alternatives that incorporate containment, in-situ treatment, off-site disposal, and ex-situ treatment. The preliminary remedial alternatives included in Table 6-1 are listed below:

- P1 – No Action;
- P2 – Capping and Electrical Resistive Heating;
- P3 – Capping and In-Situ Chemical Oxidation;
- P4 – Capping and Permeable Reactive Barrier;
- P5 – Selective Excavation and Electrical Resistive Heating;
- P6 – Selective Excavation and In-Situ Chemical Oxidation; and
- P7 – Selective Excavation and Permeable Reactive Barrier.

Except for the no-action alternative, each preliminary remedial alternative also includes the following elements:

- Institutional controls on property;

- Engineered controls for residences overlying areas with a risk greater than 1×10^{-6} for future on-site residents and greater than 1×10^{-5} for on-site landscapers and utility workers; and
- Groundwater monitoring of the dissolved phase plume.

6.3.2 Retained Preliminary Remedial Alternatives

Preliminary remedial alternatives were screened against the criteria of effectiveness, implementability, and cost. After this screening step, three of the preliminary remedial alternatives were retained for detailed analysis. These are:

- P1 – No Action;
- P5 – Selective Excavation and Electrical Resistive Heating; and
- P6 – Selective Excavation and In-Situ Chemical Oxidation.

These final remedial alternatives are listed in Table 6-2, renumbered as Alternatives 1, 2, and 3. They include two alternatives that incorporate off-site disposal and in-situ treatment. Alternatives 2 and 3 also include the three common elements identified above (institutional controls, engineered controls, and groundwater monitoring). Reasons for retention of these three final remedial alternatives are provided below.

6.3.2.1 P1 – No Action

P1 – No Action is retained as required by USEPA guidance for comparison and baseline purposes.

6.3.2.2 P5 – Selective Excavation and Electrical Resistive Heating

The preliminary remedial alternative P5, Selective Excavation and Electrical Resistive Heating, includes excavation of impacted soils and removal of VOCs and DNAPL mass in the source zone / groundwater via electrical resistive heating.

Selective excavation of soils would effectively mitigate direct contact with impacted soils as well as remove high concentrations of PCB-impacted soil and mitigate the potential for PCB-impacted soil to degrade groundwater. Use of electrical resistive heating would effectively destroy contaminant mass (DNAPL) in the unsaturated and saturated portions of the source zone, thereby mitigating the major risk driver at the Site. The alternative would provide significant mass reduction and will be retained for detailed analysis because it meets the threshold criteria of overall protection of human health and the environment, and it meets ARARs.

6.3.2.3 P6 – Selective Excavation and In-Situ Chemical Oxidation

The preliminary remedial alternative P6, Selective Excavation and In-Situ Chemical Oxidation, includes excavation of impacted soils and removal of VOCs and DNAPL mass in the source zone / groundwater via in-situ chemical oxidation. Selective excavation of soils would effectively mitigate direct contact with impacted soils as well as remove high concentrations of PCB-impacted soil and mitigate the potential for PCB-impacted soil to degrade groundwater. In-situ chemical oxidation would treat DNAPL mass in the saturated portion of the source zone, but it is judged to be not as effective at DNAPL source zone reduction as is electrical resistive heating, since in-situ chemical oxidation would not effectively treat the unsaturated portion of the source zone and likely would not remediate all DNAPL within the saturated portion of the source zone. In-situ chemical oxidation is not as effective in treating fine-grained soils as is electrical resistive heating. In-situ chemical oxidation would provide significant mass reduction, however, and will be retained for detailed analysis because it meets the threshold criteria of overall protection of human health and the environment, and it meets ARARs.

6.3.3 Eliminated Preliminary Remedial Alternatives

Four of the preliminary remedial alternatives were screened, or eliminated, from further consideration. These are:

- P2 – Capping and Electrical Resistive Heating;
- P3 – Capping and In-Situ Chemical Oxidation;

- P4 – Capping and Permeable Reactive Barrier; and
- P7 – Selective Excavation and Permeable Reactive Barrier.

The reasons these four preliminary remedial alternatives were screened from further consideration are provided in the following subsections.

6.3.3.1 P2 – Capping and Electrical Resistive Heating

The preliminary remedial alternative P2, Capping and Electrical Resistive Heating, includes capping of impacted soils and removal of VOCs and DNAPL mass in the source zone / groundwater via electrical resistive heating. The soil component of this preliminary remedial alternative would include capping select areas of the Site subsequent to source zone removal in order to mitigate direct contact with the soils as well as to provide a barrier for soil vapor. Although this alternative could be accomplished technically, it would allow high concentrations of PCBs to remain in place near the DNAPL source zone. Leaving PCB-impacted soils in place may not provide protection to receptors during a future scenario, including redevelopment of the Site (i.e., exposure to PCB-impacted soil during construction and grading of the Site or during excavation for utility trenches), and may not mitigate the potential concern regarding PCB-impacted soil degrading groundwater. In addition, the presence of a cap would limit or restrict future development of the Site. This preliminary alternative therefore does not meet the effectiveness criterion or implementability criterion of USEPA. It is therefore eliminated from further evaluation.

6.3.3.2 P3 – Capping and In-Situ Chemical Oxidation.

The preliminary remedial alternative P3, Capping and In-Situ Chemical Oxidation, includes capping of impacted soils and removal of contaminant mass in the source zone / groundwater via in-situ chemical oxidation. For the same reasons discussed in Section 6.3.3.1, the capping component of the preliminary remedial alternative P3 would require limitations or restrictions on future development. In-situ chemical oxidation is not judged to be as effective at DNAPL source zone reduction as is electrical resistive heating, since in-situ chemical oxidation would not effectively treat the unsaturated portion of the source zone and likely would not remediate all

DNAPL within the saturated portion of the source zone. It is not as effective in treating fine-grained soils as is electrical resistive heating. In-situ chemical oxidation would provide significant mass reduction, however, and will be retained for detailed analysis because it meets the threshold criteria of overall protection of human health and the environment, and it meets ARARs. It is therefore eliminated from further evaluation.

6.3.3.3 P4 – Capping and Permeable Reactive Barrier

The preliminary remedial alternative P4, Capping and Permeable Reactive Barrier, includes capping of impacted soils and removal of contaminant mass in the source zone / groundwater via a permeable reactive barrier. For the same reasons discussed in Section 6.3.3.1, the capping component of preliminary remedial alternative P4 would require limitations or restrictions on future development. Based on Site water quality data and hydrogeologic information, it is assumed that a granular iron permeable reactive barrier would degrade PCE, TCE, and reduce break down compounds to non-toxic compounds. However, due to the nature of the contamination (i.e., DNAPL source zone versus dissolved-phase plume), a permeable reactive barrier would not be a viable source reduction method. Due to the installation of the permeable reactive barrier (i.e., a trench where groundwater would pass through), the technology would allow some migration of the source compared to electrical resistive heating and in-situ chemical oxidation methods that are able to attack the source zone directly.

Treatment via a permeable reactive barrier is passive and is dependant upon the rate of groundwater flow through the permeable reactive barrier. Since the Site has a low rate of groundwater flow, the effective treatment time would be significantly longer for the permeable reactive barrier than active forms of remediation such as electrical resistive heating or in-situ chemical oxidation. The permeable reactive barrier would not achieve complete source zone treatment since it would not include direct mass removal of the source zone. This lack of source zone removal would also increase the effective treatment time. Therefore, this preliminary alternative does not meet the effectiveness criterion or implementability criterion of USEPA. It is therefore eliminated from further evaluation.

6.3.3.4 P7 – Selective Excavation and Permeable Reactive Barrier

The preliminary remedial alternative P7, Selective Excavation and Permeable Reactive Barrier, includes excavation of impacted soils and removal of contaminant mass in the source zone / groundwater via a permeable reactive barrier. Selective excavation of soils would effectively mitigate direct contact with impacted soils as well as remove high concentrations of PCB-impacted soil and mitigate the potential for PCB-impacted soil to degrade groundwater. However, for the same reasons discussed in Section 6.3.3.3, the permeable reactive barrier component of preliminary remedial alternative P7 is judged to be infeasible for source zone reduction. Thus, in accordance with the USEPA guidance for screening of alternatives, preliminary remedial alternative P7, Selective Excavation and Permeable Reactive Barrier, is eliminated from further evaluation.

6.4 In-Situ Chemical Oxidation Treatability Study

To assess the suitability of in-situ chemical oxidation to remediation of Site contaminants, a treatability study was performed and data from the treatability study were used to estimate the operational parameters for this alternative. Operational parameters assessed include:

- VOC remediation effectiveness;
- Site-specific chemical demands;
- Remediation scenarios (i.e., method for chemical injection, well-spacing, etc.); and
- Remediation costs.

Treatability studies provide data for remedy decision-making processes. Specific conditions may affect the remedial technology. A site soil may consume a portion of in-situ chemical oxidation chemicals directed at VOCs, and/or remediation costs for in-situ chemical oxidation implementation methods may render them infeasible. Data from treatability tests help to assess these effects.

A treatability study was performed at the Site to evaluate the efficacy of in-situ chemical oxidation by using potassium permanganate and to collect remediation design parameters. The treatability study testing procedures and results are described in detail in the Laboratory Measurement of Natural Oxidant Demand of Soil Report [SiREM, 2004], which can be found in Appendix B of this FS Report.

GeoSyntec collected groundwater and saturated soil samples at the Site in September 2004. The sampling procedure was as follows:

- Six saturated soil samples were collected from two sampling locations in the groundwater areas impacted by PCE and TCE (URS-1 and URS-3);
- Groundwater was extracted from on-site wells and monitored during extraction for field parameters such as temperature, pH, dissolved oxygen, and turbidity;
- Groundwater samples were collected once field parameters stabilized (consecutive field measurements varied less than 10 percent); and
- Soil and groundwater samples were sent to SiREM Laboratories (SiREM) to perform a laboratory study to determine the natural oxidant demand of soils at the Site.

The samples were then subjected to bench-scale tests. Appendix C describes the in-situ chemical oxidation laboratory treatability test protocol. In general, testing included:

- In-situ chemical oxidation tests were performed on approximately six 50-gram saturated soil samples and three 25-ml VOA groundwater samples;
- Batch tests were performed to assess the chemical oxidant demand of the soil matrix;

- Batch tests were performed to assess the chemical oxidant demand of the groundwater, which contains the VOCs;
- VOC degradation rates were calculated for the specific batches;
- Chemical oxidant dosages for effective VOC destruction were calculated for the Site.

The maximum natural oxidant demand was 3.8 g/kg in the location identified as URS 1-22'. Two samples (locations URS 1-29' and URS 1-49') had no measurable oxidant demand. These data suggest that the samples have low natural oxidant demand, which is consistent with soils with low organic carbon content [SiREM, 2004]. The application of in-situ chemical oxidation, therefore, would not require significant oxidant to address non-VOC organic carbon contained in the soil.

A summary of the natural oxidant demand calculated over the 28-day incubation period for the bench-scale test, results for each soil location, and replicates prepared for each can be found in Appendix B.

6.5 Final Remedial Alternative Descriptions

6.5.1 General

A description of each final remedial alternative follows. The assumptions for each final remedial alternative, including calculations of volumes of soil to be excavated, are discussed. Each final remedial alternative is renumbered in this discussion, with its preliminary remedial alternative designation shown.

6.5.2 Common Elements of Final Remedial Alternatives

Each final remedial alternative (except the no action alternative) includes the following common elements, which are described in this section:

- Institutional controls;
- Engineered controls; and
- Groundwater monitoring.

6.5.2.1 Institutional Controls

The anticipated institutional controls for the Site would prohibit sensitive land uses (i.e., single family residence, hospitals, schools, or child-care centers), specify new building construction (i.e., first floor non-residential, upper floor residential, and inclusion of vapor control system), and prohibit on-site groundwater extraction for municipal (i.e., drinking water purposes), industrial, and agricultural (i.e., irrigation) use.

6.5.2.2 Engineered Controls

Based on the Site risk assessment, there is no unacceptable risk for the current on-site commercial use at the fitness center. However, unacceptable risk has been calculated for two hypothetical future on-site receptors: on-site residents (risk $>1 \times 10^{-6}$) and on-site commercial workers (risk $>1 \times 10^{-5}$). Engineered controls such as vapor control systems, in conjunction with an active remedy, would mitigate this potential risk. Future Site construction is proposed to be slab on grade construction or first floor parking and would include an underlying vapor control system comprising a geocomposite vapor barrier under the concrete slab, an air inlet, a vapor outlet, and vapor monitoring points consistent with current building practice. The vapor control system would be a part of any future construction, whether or not vapor controls were required. A typical vapor control system is shown in Figure 6-1. The use of engineered controls with selective excavation would accommodate the cleanup criteria for soil vapor, which are described in Exhibit 2.

6.5.2.3 Groundwater Monitoring

Groundwater monitoring currently is conducted at the Site and would continue on Site and downgradient of the Site in the A/B aquifer system in wells

designed to assess VOC concentrations and plume stability. The groundwater monitoring program would be prepared as part of the remedial design and conducted in combination with an active remedy. Annual groundwater sampling is proposed for a period of five years after active remediation is complete, until the five-year remedy review, or until the dissolved phase concentrations have shown an acceptable and persistent downward trend.

The downgradient off-site potential risk currently is acceptable. Following DNAPL remediation (i.e., source removal via remediation), a declining trend is expected in downgradient groundwater VOC concentrations, resulting in lower risk on Site and off site. If, however, in the unlikely event that VOCs were to show an initial substantial increase, a contingency plan would be implemented to assess off-site risk. Frequency of further sampling would depend upon the trend and results obtained in first five years.

USEPA guidance in *Performance Monitoring of MNA Remedies for VOCs in Groundwater* [USEPA, 2004] establishes the criteria for groundwater monitoring. Monitoring results will be compared with baseline concentrations. In addition to comparing measured values (i.e., sampling data versus baseline data), statistical procedures also would be used to evaluate the variability associated with the data and to use estimates of variability to guide decision-making processes [USEPA, 2004]. Statistical methods are also available to facilitate analysis and comparison of trends by considering data variability through time [USEPA, 2004].

6.5.3 Alternative 1 – No Action

The no action alternative consists of no remedial action, institutional controls or engineered controls to address soil, source zone, and groundwater exceeding the cleanup criteria for the Site. The source zone would not be remediated, groundwater would not be monitored, and a contingency plan would not be in place. Alternative 1 (formerly preliminary remedial alternative P1) – No Action, is included as required by USEPA guidance.

6.5.4 Alternative 2 – Selective Excavation and Electrical Resistive Heating

Alternative 2 (preliminary remedial alternative P6), Selective Excavation and Electrical Resistive Heating, consists of a combination of shallow soil excavation and soil column excavation activities to meet the soil cleanup criteria for the Site combined with electrical resistive heating to focus on source zone / groundwater remediation. The selective excavation aspect of this alternative is discussed below, with a subsequent discussion regarding application of electrical resistive heating in the source zone.

The selective excavation scenarios include the following activities:

- Clear and grub the Site of remaining vegetation and debris;
- Excavate soils that contain constituents at concentrations that exceed cleanup criteria;
- Transport soils containing hazardous constituents above cleanup criteria off site to an approved landfill for disposal;
- Import soils for backfill of the excavation;
- Compact and grade Site to desired finish grade (assumed to be present grade);
- Repave the Site¹; and
- Implement the common remedial elements described in Section 6.5.2.

The excavation scenarios in this alternative call for the off-Site disposal of the excavated PCB-containing soils and the backfill of the excavations with clean, imported soils. A storm water management plan would be prepared and implemented, if necessary. It is also anticipated that transportation plans would be developed for the off-Site disposal of impacted soils.

¹ Timing and sequence of post-excavation activities would be coordinated with redevelopment of the Site.

6.5.4.1 Shallow Soil Excavation

Shallow soil excavation would be employed to remove PCBs in shallow soils, thereby mitigating inhalation of indoor air vapors from on-site shallow soils, as well as incidental ingestion and dermal contact of on-site shallow soils. The shallow soil excavation would remove PCBs greater than 17 mg/kg in the top ten feet of soil, resulting in a site-wide average of 6.4 mg/kg (acceptable commercial worker exposure). This concentration threshold for PCBs is based upon the DTSC-approved RA showing no unacceptable risk from PCBs at a site-wide average of 6.4 mg/kg. Areas of PCB soil concentrations greater than 17 mg/kg are shown in Figure 6-2. Removal of this volume of soil would remove an estimated 95 percent of the PCBs identified in the top ten feet of soils at the Site. Removal of PCBs within the source zone is addressed in the next section of this FS Report.

The total volume of shallow soils to be excavated under this scenario is approximately 900 cubic yards (CY). The area, depth and total volume of soils to be excavated was assessed based on the existing soil data set, which was compiled from the previous RI investigation [URS, 2004b]. Excavated soils would be placed in soil stockpiles pending classification and transport for disposal at an appropriate disposal facility. The Site would then be backfilled with clean fill soil to current grade and the existing pavement would be matched. The off-Site disposal and backfill of the excavation are discussed in more detail in following sections.

6.5.4.2 Soil Column Excavation

The soil column excavation would consist of removing soils impacted with high concentrations of PCBs within a defined area in the source zone. After assessing the existing soils data set compiled from the previous RI investigation, a 20-foot diameter footprint was determined to encompass these high-concentration PCB-impacted soils (Figure 6-3). A cross-section illustrating borings lying within this 20-foot diameter footprint that delineate high PCB concentrations, laterally and with depth, is shown in Figure 6-4. The soil within this 20-foot diameter footprint would be excavated below ten feet bgs and above groundwater, via auger excavation. It is

estimated that the volume of soil removed by the soil column excavation will effectively remove approximately 92 percent of the PCB mass within the source zone. The 20-foot diameter footprint lies within the source zone, the remediation of which is discussed within Section 6.5.4.3 of this FS Report. A plan view and cross-section depicting how the soil column excavation and treatment of the source zone coincide are shown in Figures 6-5 and 6-6, respectively.

The total volume of PCB-contaminated soils to be excavated under this scenario is approximately 340 cubic yards (CY). This volume is based on a depth of 10 ft bgs to 20 ft bgs, since the top ten feet of soil will have already been removed due to the shallow soil excavation step described in Section 6.5.4.1. The area and total volume of soils to be excavated are pre-determined based on the existing soil data set, which was compiled from the previous RI investigation [URS, 2004b]. Excavated soils would be placed in soil stockpiles pending classification and transport for disposal at an appropriate disposal facility. The Site would then be backfilled with clean fill soil to current grade, and the existing pavement would be matched. The off-Site disposal and backfill of the excavation are discussed in more detail in following sections.

6.5.4.3 Electrical Resistive Heating

Electrical resistive heating is an in-situ remedial technology that is successful at removing VOC contaminants, including DNAPL, from the subsurface. Through electrical resistive heating, electricity is applied to the subsurface through electrodes to enhance the recovery of soils contaminated with VOCs and SVOCs. This process is especially effective at sites, such as this Site, where low-permeability clay soils limit the effectiveness of other technologies. Contaminants associated with low-permeability soils such as clays typically are less easily remediated by other in-situ techniques. Electrical resistive heating directly targets these finer-grained soils. It is particularly effective where rapid remediation is desired and is particularly applicable to the Site given the redevelopment issues associated with soil vapor. Details of the technology are presented below.

Electrical resistive heating can be used in both vadose and saturated zone applications and would be focused on mass removal of PCE and TCE in the source zone, which includes both vadose zone and saturated zone VOCs. The anticipated

remediation area is approximately 30 ft in diameter and is shown in Figure 6-5. Electrical resistive heating would be applied from the ground surface to a depth of approximately 50 ft bgs (total depth of detected VOCs).

Electrical resistive heating would be applied via an array of electrodes that encompass the source zone. Electrical potential would be applied to the array of electrodes, generating a voltage gradient throughout the zone of the array. The electrical current generated by electrical resistive heating would preferentially travel through the low-permeability clay soils, as the higher water content and ionic potential of the clay soils provide a more favorable current path than sand or silt soils. As the electrical current generated by the voltage gradient passes through the soil, the resistance of the soil to the current flow causes the soil temperature to rise, thereby increasing the volatility of the contaminant VOCs. As the soils are heated to the boiling point of water, the water turns to steam, stripping the VOCs from the soil pore spaces. Electrical resistive heating utilizes soil vapor extraction to collect the vapor-phase VOCs and steam by applying a vacuum to a central collection well. The steam then passes through a condenser, knockout box, and granular activated carbon (GAC) to treat the off gas and condensate. A general schematic of the electrical resistive heating process in plan view and cross section can be seen in Figures 6-7 and 6-8, respectively.

Prior to electrical resistive heating implementation, two sentinel wells would be installed downgradient of the source zone (i.e., beyond the hydraulic influence of the electrical resistive heating system). The sentinel wells would be screened within coarse-grained soils in which DNAPL can migrate more easily and can result in higher dissolution rates than would be expected in fine-grained soils. Soil vapor concentrations would be assessed during remediation to monitor the progress of the technology and to assess the degree of contaminant mass removal. Electrical resistive heating operates to the limit of the technology, until soil vapor concentrations are asymptotic (or ND) or until the operating period anticipated during the design of the system is attained. Electrical resistive heating is anticipated to operate at the Site for up to six months, based on preliminary data evaluation.

Confirmation sampling would be conducted in the sentinel wells periodically, during and after electrical resistive heating. Further operation of the electrical resistive heating system would be dependant on results of confirmation sampling and evaluation of system operations. The remaining soil vapor would be

assessed after operation is complete as part of the post-remedy soil vapor baseline survey, described in Section 6.5.4.4. In the unlikely event that a significant amount of TCE or PCE migrates from the electrical resistive heating treatment area in dissolved phase during or immediately following the electrical resistive heating treatment, a contingency plan would be implemented that would include injection of chemical oxidant (permanganate) into wells within or downgradient of the zone of treatment to reduce and manage concentrations.

6.5.4.4 Post-Remedy Soil Vapor Baseline Survey

After the remedy is complete, there should be an observable declining trend in Site-wide soil vapor concentrations, given that the source zone is believed to be the source of the soil vapor. A soil vapor survey would be conducted after the source zone remedy is complete to provide a baseline for the subsequent assessment of the decline in residual soil vapor concentrations throughout the Site. The need for additional sampling events would depend upon the results of the soil vapor baseline survey. To conduct the survey, a sampling plan would be developed that would include sampling at multiple depths in the vadose zone. The sampling plan would include an assessment of the time to reach soil vapor equilibrium throughout the Site after the remedy is complete.

The results of the soil vapor baseline survey also will be used to assess the need for institutional controls due to soil vapor. Any required control measures (i.e., vapor control systems) would be defined in a risk management plan developed to accompany the sampling plan. The risk management plan would be consistent with DTSC guidance and would address controls required until VOCs decline to levels which would not require use of the vapor control system. Included items would be monitoring, reporting, and notifications.

6.5.5 Alternative 3 – Selective Excavation and In-Situ Chemical Oxidation

Alternative 3 (preliminary remedial alternative P7), Selective Excavation and In-Situ Chemical Oxidation, consists of a combination of shallow soil excavation and soil column excavation activities to meet the soil cleanup criteria for the Site in

combination with in-situ chemical oxidation to focus on source zone / groundwater remediation. The selective excavation aspect of this alternative is discussed below, with a subsequent discussion regarding in-situ chemical oxidation.

The selective excavation scenarios include the following activities:

- Clear and grub the Site of remaining vegetation and debris;
- Excavate soils that contain constituents at concentrations that exceed cleanup criteria;
- Transport soils containing hazardous constituents above cleanup criteria off site to a landfill for disposal;
- Import soils for backfill of the excavation;
- Compact and grade Site to desired finish grade (assumed to be present grade);
- Repave the Site²; and
- Implement the common remedial elements described in Section 6.5.2.

The excavation scenarios in this alternative call for the off-Site disposal of the excavated PCB-containing soils and the backfill of the excavations with clean, imported soils. A storm water management plan would be prepared and implemented, if necessary. It is also anticipated that transportation plans would be developed for the off-Site disposal of impacted soils.

6.5.5.1 Shallow Soil Excavation

² Timing and sequence of post-excavation activities would be coordinated with redevelopment of the Site.

Shallow soil excavation would be employed to remove PCBs in shallow soils, thereby mitigating inhalation of indoor air vapors from on-site shallow soils, as well as incidental ingestion and dermal contact with on-site shallow soils. The shallow soil excavation would remove PCBs greater than 17 mg/kg in the top ten feet of soil, resulting in a site-wide average of 6.4 mg/kg (acceptable commercial worker exposure). This concentration threshold for PCBs is based upon the DTSC-approved risk assessment showing no unacceptable risk from PCBs at a site-wide average of 6.4 mg/kg. Areas of PCB soil concentrations greater than 17 mg/kg are shown in Figure 6-2. Removal of this volume of soil would remove an estimated 95 percent of the PCBs identified in the top ten feet of soils at the Site. Removal of PCBs within the source zone is addressed in the next section of this FS Report.

The total volume of shallow soils to be excavated under this scenario is approximately 900 cubic yards (CY). The area, depth, and total volume of soils to be excavated were assessed based on the existing soil data set, which was compiled from the previous RI [URS, 2004b]. Excavated soils would be placed in soil stockpiles pending classification and transport for disposal at an appropriate disposal facility. The Site would then be backfilled with clean fill soil to current grade, and the existing pavement would be matched. The off-Site disposal and backfill of the excavation are discussed in more detail in following sections.

6.5.5.2 Soil Column Excavation

The soil column excavation would consist of removing soils impacted with high concentrations of PCBs within a defined area in the source zone. After assessing the existing soils data set compiled from the previous RI investigation, a 20-foot diameter footprint was determined to encompass these high-concentration PCB-impacted soils (Figure 6-3). A cross-section illustrating borings lying within this 20-foot diameter footprint that delineate high PCB concentrations, laterally and with depth, is shown in Figure 6-4. The soil within this 20-foot diameter footprint would be excavated below 10 ft bgs and above groundwater, via auger excavation. It is estimated that the volume of soil removed by the soil column excavation will effectively remove approximately 92 percent of the PCB mass within the source zone. The 20-foot diameter footprint lies within the source zone, the remediation of which is discussed within Section 6.5.4.3 of this FS Report. A plan view and cross-section depicting how

the soil column excavation and treatment of the source zone coincide are shown in Figures 6-5 and 6-6, respectively.

The total volume of PCB-contaminated soils to be excavated under this scenario is approximately 340 cubic yards (CY). This volume is based on a depth of 10 ft bgs to 20 ft bgs, since the top ten feet of soil will have already been removed due to the shallow soil excavation step described in Section 6.5.4.1. The area and total volume of soils to be excavated are pre-determined based on the existing soil data set, which was compiled from the previous RI investigation [URS, 2004b]. Excavated soils would be placed in soil stockpiles pending classification and transport for disposal at an appropriate disposal facility. The Site would then be backfilled with clean fill soil to current grade, and the existing pavement would be matched. The off-Site disposal and backfill of the excavation are discussed in more detail in following sections.

6.5.5.3 In-Situ Chemical Oxidation

In-situ chemical oxidation involves the delivery of chemical oxidants to contaminated media to destroy the contaminants by converting them to environmentally acceptable endpoints. The oxidants typically involved in this process are potassium permanganate, hydrogen peroxide, or to lesser extent, dissolved oxygen [ITRC, 2001]. Literature indicates that potassium permanganate is more efficient at destroying PCE and TCE than is hydrogen peroxide and that potassium permanganate has a less detrimental effect on anaerobic bioattenuation parameters [Gates-Anderson, 2001] at some sites. For other chemicals and stratigraphic settings, hydrogen peroxide is a more effective option and both methods have case studies supporting their applications. Case study data indicate that costs for both technologies are similar.

A treatability study was performed by using potassium permanganate to determine the operational parameters for the potential remedy (see Section 6.4 and Appendix B). The results of the treatability study indicated that there was a low aquifer oxidant demand at the Site. This means that a minimum amount of permanganate would be consumed by the natural aquifer matrix and most of the oxidant would be available to treat the contaminants.

In-situ chemical oxidation is a saturated zone technology that would not remedy the vadose zone within the source zone. In-situ chemical oxidation would be focused on mass removal of PCE and TCE in the source zone. The anticipated remediation area is approximately 30 ft in diameter and is shown in Figure 6-5 (same as the electrical resistive heating treatment area). In-situ chemical oxidation would be applied from approximately 20 ft bgs (groundwater) to a depth of approximately 50 ft bgs (total depth of detected VOCs).

In-situ chemical oxidation would be focused on the source zone and would be employed by injecting a batch solution of potassium permanganate into the saturated zone via wells. The wells would be screened throughout the saturated zone, and the solution would then infiltrate into the surrounding saturated medium over time, oxidizing VOCs contained in groundwater. A general schematic of the in-situ chemical oxidation process in cross section can be seen in Figure 6-9. The potassium permanganate would be allowed to react in the aquifer for a period of time before low-flow purging and sampling would occur. COC and degradation products would then be monitored to determine technology effectiveness and contaminant removal. The required well connections and delivery methods (including flow rates, dosing, and procedures for injecting chemical oxidants) would be addressed in the remedial design. Equipment and supplies would include chemicals, liquid storage tank, pump, and monitoring devices.

Three to four injection events would be anticipated. During each event, enough potassium permanganate would be injected into the subsurface to equal 1-pore volume. It is assumed that oxidant would be delivered by truck to the Site in a pre-mixed liquid batch solution, 5% by weight. Oxidant batches would be pumped directly into the injection wells. Injection events are assumed to be at regular intervals of every three months for FS purposes. Groundwater quality data downgradient of the source zone would be monitored through periodic sampling and analysis of select wells for VOCs, oxidation-reduction potential, chloride, dissolved oxygen, and general minerals.

An exclusion zone surrounding the injection wells would be established when oxidant is being added. Public access to the injection wells would be prevented with the use of locked traffic boxes or vaults. Construction should not involve any special health and safety concerns for nearby residents.

6.5.5.4 Post-Remedy Soil Vapor Baseline Survey

After the remedy is complete, there should be an observable declining trend in Site-wide soil vapor concentrations, because of the expected decrease in VOC concentrations within the source zone. A soil vapor survey would be conducted after the in-situ chemical oxidation remedy is complete to provide a baseline for the subsequent assessment of the fate of residual soil vapor concentrations throughout the Site. The need for additional sampling events would depend upon the results of the soil vapor baseline survey. To conduct the survey, a sampling plan would be developed that would include sampling at multiple depths in the vadose zone. The sampling plan would include an assessment of the time to reach soil vapor equilibrium throughout the Site after the in-situ chemical oxidation remedy is complete.

The results of the soil vapor baseline survey also will be used to assess the need for institutional controls due to soil vapor. Any required control measures (i.e., vapor control systems) would be defined in a risk management plan developed to accompany the sampling plan. The risk management plan would be consistent with DTSC guidance and would address controls required until VOCs decline to levels which would not require use of the vapor control system. Included items would be monitoring, reporting, and notifications.

7. DETAILED ANALYSIS OF ALTERNATIVES

7.1 General

This section includes a detailed analysis of the final remedial alternatives for the Site. An overview of the nine criteria used for the detailed analysis is presented below.

7.2 Detailed Analysis Criteria

The CERCLA guidance document explains the nine criteria that are used to evaluate each remedial alternative [USEPA, 1988]. The first two criteria relate directly to findings that must be made in the Record of Decision (ROD) for the Site. These are categorized as threshold criteria that a selected remedy must meet.

- 1) **Overall Protection of Human Health and the Environment** – This criterion requires evaluation of how the alternative achieves and maintains protection of human health and the environment. The overall assessment of protectiveness draws on the assessments conducted under other evaluation criteria, especially long-term effectiveness and permanence, short-term effectiveness, and compliance with ARARs. Evaluation of the overall protectiveness of an alternative focuses on whether an alternative achieves adequate protection and describes how risks posed through each pathway are eliminated, reduced, or controlled through treatment, engineered controls or institutional controls. This evaluation also considers whether an alternative poses any unacceptable short-term or cross-media impacts.
- 2) **Compliance with ARARs** – This criterion requires an evaluation of how the alternative complies with identified ARARs and applicable advisories or guidance that are “to be considered.” ARARs are generally categorized as action specific, location specific, or chemical specific Federal or state-promulgated requirements. A list of potential Federal and state action-specific, location-specific, or chemical-

specific ARARs have been identified for the Site and are included in Tables 7-1 and 7-2, respectively.

The following five criteria are “balancing” criteria. They represent the primary criteria upon which the detailed analysis is based and that are used to distinguish among alternatives that meet the threshold requirements above. The alternative that strikes the best balance among these five criteria and that meets the threshold criteria generally is the preferred alternative.

- 3) **Long-term Effectiveness and Permanence** – Requires evaluation of the long-term effectiveness of the remedial alternative in maintaining protection of human health and the environment following implementation of the alternative.
- 4) **Reduction of Toxicity, Mobility, and Volume Through Treatment** – The assessment against this criterion evaluates the anticipated performance of the treatment technologies that the alternative comprises, and assesses their ability to reduce the toxicity, mobility and volume of contaminated materials through the use of treatment.
- 5) **Short-term Effectiveness** – Requires an assessment of the protection of human health and the environment during construction and implementation of the remedial alternative until RAOs are met. The following factors are addressed as appropriate for each alternative: protection of the community during remedial actions; protection of workers during remedial actions; environmental impacts; and time until remedial response objectives are achieved.
- 6) **Implementability** – This criterion requires an assessment of the technical and administrative feasibility of an alternative, including the availability of required services and materials to execute the alternative.
- 7) **Cost** – Requires evaluation of the anticipated capital costs and operation and maintenance (O&M) costs of an alternative. For this FS

Report, O&M costs are presented in 2005 dollars using both a 5-percent discount rate and non-discounted.

The following two criteria will be considered following comment on this FS Report and on the Remedial Action Plan (RAP), which will be developed by DTSC following approval of this FS Report. They are not further considered in this FS Report:

- 8) **State Acceptance** – Allows for consideration of preferences or apparent concerns by the State of California Department of Toxic Substances Control (DTSC).
- 9) **Community Acceptance** – Allows for consideration of the community's preferences or concerns regarding remedial alternatives. DTSC formally considers the community's preferences or concerns after this FS Report and proposed plan are prepared.

7.3 **Final Remedial Alternatives – Detailed Analysis**

7.3.1 **General**

This section includes the detailed analysis of the three final remedial alternatives presented in Section 6.5 and in Table 6-2. Each alternative is analyzed separately according to the nine criteria listed above. The common elements of the final remedial alternatives are not evaluated as they are the same for each alternative. A summary of the detailed analysis of the final remedial alternatives is shown in Table 7-5.

7.3.2 **Final Remedial Alternative 1– No Action**

7.3.2.1 **Overall Protection of Human Health and the Environment**

The no action alternative does not effectively mitigate potential future risks associated with the ingestion, inhalation, or direct contact of Site soils, soil vapor, or

groundwater. It does not provide any means for source zone mass removal and would not be protective of human health under the hypothetical future scenario use. Because the no action alternative does not meet the threshold requirement of providing overall protection of human health and the environment, no further analysis of this alternative is performed.

7.3.3 Final Remedial Alternative 2 – Selective Excavation and Electrical Resistive Heating

7.3.3.1 Recap of Alternative Description

Alternative 2, Selective Excavation and Electrical Resistive Heating, consists of a combination of shallow soil excavation and soil column excavation to meet the soil cleanup criteria for the Site as well as electrical resistive heating to focus on source zone / groundwater remediation.

Shallow soil excavation would be employed to remove PCBs in shallow soils, thereby mitigating incidental ingestion and dermal contact of on-site shallow soils. The shallow soil excavation would remove PCBs greater than 17 mg/kg in the top ten feet of soil, resulting in a site-wide average of 6.4 mg/kg (acceptable commercial worker exposure). This concentration threshold for PCBs is based upon the DTSC-approved RA showing no unacceptable risk from PCBs at a site-wide average of 6.4 mg/kg. Areas of PCB soil concentrations greater than 17 mg/kg are shown in Figure 6-2. Removal of this volume of soil would remove an estimated 95 of the PCBs identified in soils in the top ten ft of the Site. The total volume of shallow soils to be excavated under this scenario is approximately 900 cubic yards (CY).

The soil column excavation would consist of removing soils impacted with high concentrations of PCBs within a defined area in the source zone. A 20-foot diameter footprint was determined to encompass these high-concentration PCB-impacted soils. Removal of this soil column would remove an estimated 92 percent of the PCB mass within the source zone.

Electrical resistive heating would be used in both vadose and saturated zone applications and would be focused on mass removal of PCE and TCE in the source

zone, which includes both vadose zone and saturated zone VOCs. The anticipated remediation area is approximately 30 ft in diameter and is shown in Figure 6-5. Electrical resistive heating would be applied from the ground surface to a depth of approximately 50 ft bgs (total depth of detected VOCs).

The alternative also would include the common elements of institutional controls, engineered controls, and groundwater monitoring.

7.3.3.2 Overall Protection of Human Health and the Environment

The exposure pathways of concern for the Site are ingestion and direct contact with impacted soil, inhalation of soil vapors in indoor air from the source zone, and ingestion of groundwater. Excavation and off-site disposal of soils combined with mass removal of the source zone via electrical resistive heating would provide overall long-term protection of human health. Selective excavation methods would remove the soils that contain concentrations of PCBs exceeding cleanup criteria. Electrical resistive heating would mitigate the potential risk from soil vapors by destroying the mass of VOCs in the entire source zone. In addition, the common elements of this final remedial alternative would provide additional protection to human health and the environment. Institutional controls would prohibit sensitive land uses, require engineered controls, and prohibit on-site groundwater extraction. Engineered controls would include a vapor control system beneath all new construction to protect receptors from potential infiltration of residual soil vapors, and groundwater monitoring would assess plume stability and dissolved phase contaminant reduction.

7.3.3.3 Compliance with ARARs

ARARs potentially applicable to Site remedial actions are shown in Tables 7-1 and 7-2. Excavation and off-Site disposal of soils containing PCBs can be performed in compliance with applicable disposal and transportation regulations. Off-site disposal requires compliance with land disposal restrictions and hazardous waste regulations to the extent that soils constitute hazardous remediation wastes. Precautions would be required to ensure that short-term community and worker exposures to dust, noise, truck traffic, and VOC emissions are limited to acceptable

levels during soil excavation and handling, per ambient air quality health standards. Electrical resistive heating would also meet identified ARARs.

7.3.3.4 Long-term Effectiveness and Permanence

Once completed, implementation of Alternative 2, Selective Excavation and Electrical Resistive Heating, would provide long-term mitigation of potential human health risks from the main health risk concern at the Site, which is soil vapor associated with DNAPL. Soils posing a potential risk to future receptors (PCB concentrations greater than 17 mg/kg) would be removed within the top ten feet of the Site, thereby achieving a Site-wide average PCB concentration of 6.4 mg/kg. Soils within the auger excavation footprint within the source zone would be removed to 20 ft bgs. Therefore, Alternative 2 would be a permanent solution for mitigating human health risks from on-site soils.

Contaminants contained in low permeability soils such as clays typically are not easily remediated by in-situ techniques. Electrical resistive heating directly targets contaminants found in these finer-grained soils. It is particularly effective where rapid remediation is desired, and would be especially applicable to the Site in connection with future redevelopment of this property. Long-term controls or systems requiring maintenance would be minimal: vapor control systems and groundwater monitoring wells.

Electrical resistive heating would attack the source zone and effectively provide mass removal of DNAPL, resulting in an effective long-term permanent solution. The effectiveness of this technology would be evaluated and assessed through the soil vapor samples taken during operation, confirmation samples taken when the remedy is complete, and groundwater monitoring to assess and manage the dissolved-phase plume. Continued reliance on institutional controls and operation and maintenance of existing engineered controls would provide long-term effectiveness.

7.3.3.5 Reduction in Toxicity, Mobility, or Volume Through Treatment

With Alternative 2, Selective Excavation and Electrical Resistive Heating, soils exceeding the proposed cleanup criteria shown in Table 4-4 would be disposed of in an off-site landfill, which would result in an overall reduction of toxicity or volume at the Site, but not through treatment. Soils that remain on Site would not present significant future risk.

Electrical resistive heating would provide for significant reduction of toxicity, volume, and mobility of hazardous substances through treatment (i.e., mass removal) of VOCs in the source zone, resulting in a decrease of VOC concentrations in the dissolved-phase plume and removing the DNAPL source of the Site soil vapor.

7.3.3.6 Short-term Effectiveness

Alternative 2, Selective Excavation and Electrical Resistive Heating, does not contain significant short-term effectiveness issues. A health and safety plan would be prepared prior to field activities to ensure that the proper precautions are taken regarding to workers' health and safety. These precautions include the assurance that personal protective equipment is worn during excavation activities, proper ambient air monitoring is conducted during excavation activities, and proper dust suppressant measures are taken during excavation activities, if necessary. Receptors in the area would be protected by measures taken to control dust and emissions during excavation. Electrical resistive heating poses no significant risk to receptors or workers that cannot readily be mitigated by employing prudent health and safety measures.

The construction of the electrical resistive heating array within the source zone is estimated to take only a few weeks. Electrical resistive heating systems can be installed completely within the subsurface as to not disturb current activities at or near the Site. Electrical resistive heating should provide measurable results relatively quickly in the source zone.

7.3.3.7 Implementability

Excavation of Site soils can be performed with locally available earth moving equipment and contractors trained to handle hazardous materials. Neither of the excavation elements of this alternative requires dewatering of the excavation.

The construction of the electrical resistive heating array can be performed with commonly available construction equipment and materials by using contractors trained to work with hazardous materials. Once introduced to the source zone, electrical resistive heating is a reliable, proven, and effective technology for destruction of DNAPL. Vapors and condensate created during operation of remedy would be treated and discharged.

7.3.3.8 Cost

A separate cost estimate was prepared for each excavation scenario, as well as for the implementation, operation, and maintenance of electrical resistive heating. These costs can be found in Tables 7-3 and 7-3a. The costs include a summary of capital and O&M costs. The cost summary for implementation of the final remedial alternative 2, Selective Excavation and Electrical Resistive Heating, follows:

Alternative and Scenario	Capital Cost	Annual O&M	Discounted 5 Year O&M Cost	Non-Discounted 5 Year O&M Cost
Shallow Soil Excavation	\$369,000	-	-	-
Soil Column Excavation	\$324,000	-	-	-
Electrical Resistive Heating	\$500,000	-	-	-
Post-Remedy Survey	\$20,000	-	-	-
Engineered Controls (Vapor Control System)	\$450,000	-	-	-
Groundwater Monitoring	\$15,000	\$10,000	\$43,300	\$50,000
Other Tasks (See Detailed Cost)	\$55,000	-	-	-
TOTALS	\$1,733,000	\$10,000	\$43,300	\$50,000

Total Capital Cost: \$1,733,000

Total Annual O&M Cost: \$10,000

Total Cost (With Discounted 5 Year O&M): \$1,776,000

Total Cost (With Non-Discounted O&M): \$1,783,000

7.3.4 Final Remedial Alternative 3– Selective Excavation and In-Situ Chemical Oxidation

7.3.4.1 Recap of Alternative Description

Alternative 3, Selective Excavation and In-Situ Chemical Oxidation, consists of a combination of shallow soil excavation and soil column excavation activities to meet the soil cleanup criteria for the Site as well as in-situ chemical oxidation to focus on source zone / groundwater remediation.

Shallow soil excavation would be employed to remove PCBs in shallow soils, thereby mitigating inhalation of indoor air vapors from on-site shallow soils, as well as incidental ingestion and dermal contact of on-site shallow soils. The shallow soil excavation would remove PCBs greater than 17 mg/kg in the top ten feet of soil,

resulting in a site-wide average of 6.4 mg/kg (acceptable commercial worker exposure). This concentration threshold for PCBs is based upon the DTSC-approved RA showing no unacceptable risk from PCBs at a site-wide average of 6.4 mg/kg. Areas of PCB soil concentrations greater than 17 mg/kg are shown in Figure 6-2. Removal of this volume of soil would remove an estimated 95 percent of the PCBs identified in the top ten ft of soils at the Site. The total volume of shallow soils to be excavated under this scenario is approximately 900 cubic yards (CY).

The soil column excavation would consist of removing soils impacted with high concentrations of PCBs within a defined area in the source zone. A 20-foot diameter footprint was determined to encompass these high-concentration PCB-impacted soils. Removal of this soil column would remove an estimated 92 percent of the PCB mass within the source zone.

In-situ chemical oxidation would require delivery of chemical oxidants to the saturated zone of the subsurface to destroy DNAPL in the source zone. A batch solution of potassium permanganate would be injected into the saturated zone via wells. The wells would be screened throughout the saturated zone (from 20 ft bgs to 50 ft bgs), and the solution would then infiltrate into the surrounding saturated medium over time, oxidizing VOCs contained in groundwater. The potassium permanganate would be allowed to react in the aquifer for a period of time before low-flow purging and sampling would occur. COCs and degradation products would then be monitored to determine technology effectiveness and contaminant removal. The technology would not be effective in removing VOCs from vadose zone soils within the source zone.

The alternative also would include the common elements of institutional controls, engineered controls, and groundwater monitoring.

7.3.4.2 Overall Protection of Human Health and the Environment

The exposure pathways of concern for the Site are ingestion and direct contact of impacted soil, inhalation of soil vapors in indoor air from the source zone, and ingestion of groundwater. Excavation and off-site disposal of soils combined with mass removal of the source zone via in-situ chemical oxidation would provide overall long-term protection of human health. Remediation with in-situ chemical oxidation

likely would leave some VOCs in vadose soils and would not address all of the VOCs in the source zone. Selective excavation methods would remove the soils that contain concentrations of PCBs exceeding cleanup criteria, and electrical resistive heating would mitigate the potential risk from soil vapors by reducing the mass of VOCs in groundwater and managing the dissolved-phase plume. In addition, the common elements of this final remedial alternative would provide additional protection to human health and the environment. Institutional controls would prohibit sensitive land uses, require engineered controls, and prohibit on-site groundwater extraction. Engineered controls would include a vapor control system beneath all new construction to protect receptors from infiltration of soil vapors, and groundwater monitoring would assess plume stability and dissolved phase contaminant reduction. It would also permit timely assessment of any temporal increase in VOC concentrations that may result in an increased risk for the Site.

7.3.4.3 Compliance With ARARs

ARARs potentially applicable to Site remedial actions are shown in Tables 7-1 and 7-2. Excavation and off-Site disposal of soils containing PCBs can be performed in compliance with applicable disposal and transportation regulations. Off-site disposal requires compliance with land disposal restrictions and hazardous waste regulations to the extent that soils constitute hazardous remediation wastes. Precautions would be required to ensure that short-term community and worker exposures to dust, noise, truck traffic, and VOC emissions are limited to acceptable levels during soil excavation and handling, per ambient air quality health standards. In-situ chemical oxidation would also meet identified ARARs.

7.3.4.4 Long-term Effectiveness and Permanence

Once completed, implementation of Alternative 3, Selective Excavation and In-Situ Chemical Oxidation, would provide long-term mitigation of potential human health risks from the main health risk concern at the Site, which is soil vapor associated with DNAPL. Soils posing a potential risk to future receptors (PCB concentrations greater than 17 mg/kg) would be removed within the top ten feet of the Site, thereby achieving a Site-wide average PCB concentration of 6.4 mg/kg. Soils within the auger

excavation footprint within the source zone would be removed to 20 ft bgs. Therefore, Alternative 2 would be a permanent solution for mitigating residual human health risks from on-site soils.

Contaminants associated with low-permeability soils such as clays typically are less easily remediated by in-situ techniques. This is also true of in-situ chemical oxidation. As a result, long-term controls or systems requiring maintenance would be important to the remedy: vapor control systems and groundwater monitoring wells.

In-situ chemical oxidation would attack the saturated zone within the source zone and provide mass removal of DNAPL from 20 ft bgs to 50 ft bgs, although the degree of reduction is unknown because of the limitations of the technology in addressing DNAPL contamination in fine-grained soils. To the extent that DNAPL is actually removed, source zone mass removal would result in an long-term permanent solution within the saturated zone. Because DNAPL contamination would remain in the vadose zone, the overall long-term effectiveness and permanence of this alternative is significantly limited. The effectiveness of this technology would be evaluated and assessed through the groundwater samples taken in the injection wells, as well as soil vapor sampling and downgradient groundwater monitoring to assess and manage the dissolved-phase plume. Continued reliance on institutional controls and engineered controls would provide long-term effectiveness.

7.3.4.5 Reduction of Toxicity, Mobility, and Volume Through Treatment

With Alternative 3, Selective Excavation and In-Situ Chemical Oxidation, soils exceeding the proposed cleanup criteria shown in Table 4-4 would be disposed of in an off-Site landfill, which would result in an overall reduction of toxicity or volume through treatment. Soils that remain on Site would not present significant future risk.

In-situ chemical oxidation would provide for reduction of toxicity, volume, and mobility of hazardous substances through treatment in the saturated zone within the source zone, resulting in a decrease of VOC concentrations in the dissolved phase plume. The rate at which this reduction would occur would be evaluated by using groundwater monitoring data.

7.3.4.6 Short-term Effectiveness

Alternative 3, Selective Excavation and In-Situ Chemical Oxidation, does not contain significant short-term effectiveness issues. A health and safety plan would be prepared prior to any field activities to ensure the proper precautions are taken regarding to workers' health and safety. These precautions include the requirement that personal protective equipment is worn during excavation activities, proper ambient air monitoring is conducted during excavation activities, and proper dust suppressant measures are taken during excavation activities, if necessary. Receptors in the area would be protected by measures taken to control dust and emissions during excavation. In-situ chemical oxidation poses no significant risk to receptors or workers that cannot readily be mitigated by employing prudent health and safety measures.

The installation of injection wells is estimated to take only a few days and likely could be accomplished without significant emissions. Chemical oxidation should provide measurable results relatively quickly in areas immediately downgradient of the source zone. During the period of injection, there would be periodic deliveries of a chemical oxidant (permanganate) to recharge the aquifer. Since permanganate is a reactive chemical, the periodic delivery would require maintaining a small exclusionary zone for a short period of time, estimated at one day or less per event.

7.3.4.7 Implementability

Excavation of Site soils can be performed with locally available earth moving equipment and contractors trained to handle hazardous materials. Neither of the excavation elements of this alternative requires dewatering of the excavation.

The construction of injection wells can be performed with commonly available construction equipment and materials by using contractors trained to work with hazardous materials. Once introduced to the groundwater system, chemical oxidation is a reliable, proven, and effective technology for destruction of chlorinated VOCs.

The injections wells likely would be operated in batch, where oxidant can be periodically delivered by tank truck. Monitoring of the oxidant level in the wells would provide data on quantities of chemical being released to the subsurface. Scheduling of oxidant batches would be optimized based on an evaluation of these data and groundwater monitoring results.

For costing purposes, GeoSyntec assumes that treatment through in-situ chemical oxidation would be completed through four injection events. This is a significant unknown associated with the remedy, however. Post-injection monitoring would be employed to assess the degree of VOC reduction and the likelihood of further reduction with additional injection events.

7.3.4.8 Cost

A separate cost estimate was prepared for each excavation scenario, as well as for the implementation, operation, and maintenance of in-situ chemical oxidation. These costs, shown in Tables 7-4 and 7-4a, include a summary of capital and O&M costs. The cost summary for implementation of Alternative 3, Selective Excavation and In-Situ Chemical Oxidation, follows:

Alternative and Scenario	Capital Cost	Annual O&M	Discounted 5 Year O&M Cost	Non-Discounted 5 Year O&M Cost
Shallow Soil Excavation	\$369,000	-	-	-
Soil Column Excavation	\$324,000	-	-	-
In-Situ Chemical Oxidation	\$97,000	\$300,000	-	-
Post-Remedy Survey	\$20,000	-	-	-
Engineered Controls (Vapor Control System)	\$450,000	-	-	-
Groundwater Monitoring	\$15,000	\$10,000	\$43,300	\$50,000
Other Tasks (See Detailed Cost)	\$55,000	-	-	-
TOTALS	\$1,330,000	\$310,000	\$43,300	\$50,000

Total Capital Cost: \$1,330,000

Total Annual O&M Cost: \$310,000

Total Cost (With Discounted 5 Year O&M): \$1,674,000

Total Cost (With Non-Discounted O&M): \$1,680,000

Table 7-5 provides a summary of the detailed analysis for each final remedial alternative compared to the nine criteria discussed in Section 7.2 of this report.

8. COMPARATIVE ANALYSIS OF ALTERNATIVES

8.1 General

In this section, the final remedial alternatives are compared by using the detailed analysis criteria. The purpose of this comparative analysis is to identify the relative advantages and disadvantages of each final remedial alternative and to provide a basis for identifying the preferred remedial alternative.

8.2 Final Remedial Alternatives

8.2.1 General

In Table 8-1, each final remedial alternative is assigned a ranking for each detailed analysis criterion. These rankings range from “low” to “high” and are accompanied with a numeric ranking from 1 to 5³. At the conclusion of the comparative analysis, the preferred remedial alternative is identified.

8.2.2 Overall Protection of Human Health and the Environment

Alternative 1, No Action, does not provide adequate protection of human health and the environment. No further assessment or comparison with this alternative is provided. Alternative 2 would perform better than Alternative 3 with respect to overall protection of human health and the environment because of the greater degree of DNAPL and VOC mass that would be destroyed through the use of electrical resistive heating as opposed to in-situ chemical oxidation. Alternative 2 would meet the threshold requirement of protectiveness more easily than would Alternative 3. Specific comparative points follow.

³ A numeric ranking of “1” is lowest, or worst; “5” is highest, or best. With respect to cost, “1” is most expensive; “5” is least expensive.

- With the exception of Alternative 1, No Action, the two remaining alternatives meet the threshold requirement of providing overall long-term protection of human health and the environment, although Alternative 2 would meet the requirement more readily than would Alternative 3.
- Alternative 2, Selective Excavation and Electrical Resistive Heating, would provide long-term protection by removing soils containing high concentrations of PCBs, in turn mitigating the risk via ingestion and direct contact of these soils. Alternative 2 also would provide protection by effectively reducing DNAPL and VOC contamination both in the unsaturated and saturated portions of the source zone through electrical resistive heating, which in turn would mitigate indoor air risk from soil vapor as well as managing the dissolved phase plume. Institutional controls and engineered controls would provide added protectiveness.
- Alternative 3, Selective Excavation and In-Situ Chemical Oxidation, would provide long-term protection by removing soils containing high concentrations of PCBs, in turn mitigating the risk via ingestion and direct contact of these soils. Alternative 3 also would provide protection by reducing the mass of DNAPL and VOCs within the saturated portion of the source zone through in-situ chemical oxidation, which in turn would mitigate risk to indoor air exposure as well as managing the dissolved phase plume. Alternative 3 likely would not remove as much DNAPL mass as Alternative 2 within the source zone, however, and would not remove DNAPL or VOC mass appreciably in the unsaturated portion of the source zone. Institutional controls and engineered controls would provide added protectiveness.

8.2.3 Compliance With ARARs

Alternatives 2 and 3 would perform equally well with respect to compliance with ARARs. Each of these two alternatives would meet the threshold requirement of ARARs compliance.

8.2.4 Long-term Effectiveness and Permanence

Alternative 2, Selective Excavation and Electrical Resistive Heating, is ranked higher than Alternative 3, Selective Excavation and In-Situ Chemical Oxidation, with respect to long-term effectiveness and permanence. Each alternative would provide a long-term, permanent solution that would be protective of human health and the environment. However, electrical resistive heating is shown to be more effective in destroying a DNAPL source as it acts in both the vadose and the saturated zone; whereas, in-situ chemical oxidation is effective primarily in the saturated zone. Moreover, electrical resistive heating likely would remove more contaminant mass within the saturated portion of the source zone than would in-situ chemical oxidation because it is more effective in addressing contamination in finer-grained soils and in removing DNAPL. Therefore, Alternative 2 is rated “High” with a numeric ranking of 5, and Alternative 3 is rated “Moderate” with a numeric ranking of 3. For the foreseeable future, institutional controls and engineered controls (vapor control systems) will provide risk mitigation from vapors emanating from the source zone / groundwater. Specific comparative points follow.

- Alternatives 2 and 3 each provide a long-term, permanent solution that is protective of human health and the environment. Alternative 2, however, removes more contaminant mass in the unsaturated soils and in the saturated zone and therefore provides for a higher degree of confidence in the permanence of the remedy.
- Alternatives 2 and 3 each remove PCB-impacted soil, mitigating the risk from ingestion and/or direct contact.

- Alternatives 2 and 3 each provide for long-term protection of receptors in a future building on Site because of the inclusion of vapor control systems.

8.2.5 Reduction of Toxicity, Mobility, and Volume Through Treatment

Alternatives 2 and 3 each will reduce toxicity, mobility, and volume through in-situ treatment of the source zone. Electrical resistive heating (as part of Alternative 2) will provide more source zone mass reduction than in-situ chemical oxidation (part of Alternative 3), since electrical resistive heating is able to destroy DNAPL mass in the unsaturated and saturated zones, whereas in-situ chemical oxidation is effective primarily in the saturated zone. As discussed above, Alternative 2 likely will remove more mass in the saturated zone as well, since the electrical resistive heating technology is more focused on fine-grained soils where DNAPL likely resides than is in-situ chemical oxidation. Alternative 2, Selective Excavation and Electrical Resistive Heating is rated “High” with a numeric ranking of 5. Alternative 3, Selective Excavation and In-Situ Chemical Oxidation is rated “Moderate” with a numeric ranking of 3.

8.2.6 Short-term Effectiveness

Alternatives 2 and 3 would perform equally well with respect to short-term effectiveness and present few short-term effectiveness issues. Both alternatives are rated “High” for this category and assigned a numeric rating of 5. Specific comparative points follow:

- Each alternative would be constructed in a matter of weeks after construction begins;
- Electrical resistive heating would provide treatment relatively quickly in the source zone, whereas in-situ chemical oxidation would take somewhat longer; and

- Under Alternative 3, during the period of injection there would be periodic deliveries of chemical oxidant (permanganate) solution to recharge the trench. Since permanganate is a reactive chemical, the periodic delivery would require maintaining a small exclusionary zone for a short period of time, estimated at one day or less per event.

8.2.7 Implementability

Neither of the alternatives would pose significant implementation issues. Each is rated “High” and receives a numeric ranking of 5 for implementability. Specific comparative points follow.

- Each alternative would be implemented in a matter of weeks after all administrative actions and work plans are completed;
- The electrical resistive heating system can be completely installed in the subsurface (i.e., installation and operation would not disturb current activities at or near the Site); and
- Contractors, materials, and services are commonly used and available for each of Alternatives 2 and 3.

8.2.8 Cost

Alternatives 2 and 3 are comparable with respect to cost. A comparison follows based on non-discounted 5-year O&M cost:

- The estimated cost of Alternative 2 (Total cost with non-discounted O&M) is \$1,783,000; and
- The estimated cost of Alternative 3 (Total cost with non-discounted O&M) is \$1,680,000.

8.2.9 State Acceptance

In accordance with USEPA guidance, this criterion will be addressed when DTSC is making its final remedial decision and the ROD is being prepared.

8.2.10 Community Acceptance

In accordance with USEPA guidance, this criterion will be addressed when DTSC is making its final remedial decision and the ROD is being prepared.

8.3 Preferred Remedial Alternative

Based on the comparative analysis of the remedial alternatives, the combined soil and source zone / groundwater remedial alternative that meets the RAOs and ranks the highest is Alternative 2, Selective Excavation and Electrical Resistive Heating. The elements of Alternative 2 are:

- Shallow soil excavation of approximately 900 cy of material to remove PCBs greater than 17 mg/kg in the top ten feet of soil, resulting in a site-wide average of 6.4 mg/kg (acceptable commercial worker exposure);
- Soil column excavation that would consist of removing approximately 340 cy of soils impacted with high concentrations of PCBs within the source zone. The excavation would occur at a depth of 10 ft bgs to 20 ft bgs, since the top ten feet of soil within this soil column will have already been removed due to the shallow soil excavation step described above;
- Construction and operation of an electrical resistive heating array approximately 30 ft in diameter within the source zone (from ground surface to 50 ft bgs) for mass removal of PCE and TCE and reduction of VOC concentrations in the dissolved phase plume;

- Conducting a post-remedy soil vapor baseline survey for assessment of the decline in soil vapor concentrations throughout the Site;
- Institutional controls that would prohibit sensitive land uses, would permit mixed-use redevelopment consisting of first floor commercial / non-residential use and upper floor residential use, and would prohibit on-site groundwater extraction;
- Engineered controls that would consist of an underlying vapor control system comprising a geocomposite vapor barrier under the concrete slab, an air inlet, and vapor monitoring points;
- Groundwater monitoring to evaluate the effectiveness of remediation over time and manage the dissolved phase plume; and
- A formal review of remediation effectiveness after five years.

This remedial alternative effectively mitigates the risk from ingestion, inhalation, and dermal contact with on-Site soils for future non-residential and residential occupants of buildings on Site, and future landscapers and utility workers. Electrical resistive heating in the source zone effectively treats the primary source of contamination on the Site, thereby mitigating potential indoor air exposures. Electrical resistive heating achieves mass removal of PCE and TCE in DNAPL phase as well as reducing VOC concentrations in the dissolved phase plume. Electrical resistive heating is the best technology available for the Site, as it is proven to effectively remove DNAPL in unsaturated soils as well as in saturated zones. Based on the Site-specific data within the source zone and groundwater, if electrical resistive heating cannot achieve RAOs, no other technology reviewed can do so either. In addition, the record to date for the use of electrical resistive heating at DNAPL sites contains no reported failures in reaching endpoints. Institutional and engineered controls also would prevent and mitigate the potential indoor air inhalation of any residual soil vapor of concern at the Site. Groundwater monitoring will manage the dissolved phase plume and raise awareness of any possible increase in VOC concentrations.

Potential PCB exposures to future landscapers and utility workers are mitigated through the use of excavation of shallow soils. Additional mass removal of PCBs is achieved through the removal of high-concentrations of PCBs in the soil column within the source zone.

Alternative 2 readily meets the criteria of overall protection of human health and the environment and satisfying ARARs. When evaluated against the balancing criteria, Alternative 2 provides short-term effectiveness as well as long-term effectiveness and permanence. It also reduces the toxicity, mobility, and volume of COCs in soil and in groundwater. It is readily implementable and presents an effective balance of cost against the other criteria. Alternative 2 also will do the best job of accommodating future redevelopment of the Site.

9. REFERENCES

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TABLES

TABLE 3-1
SUMMARY OF SOILS COLLECTED AND CHEMICALS DETECTED DURING SOIL ASSESSMENTS
4144 GLENCOE AVENUE SITE
LOS ANGELES, CALIFORNIA

Chemical Name	Number of Soil Samples Analyzed	Number of Detections in Soil	Range of Detected Concentrations (mg/kg)
Polychlorinated biphenyls (Aroclor 1254)	224	128	0.2 - 4,000
Polychlorinated biphenyls (Aroclor 1248)	224	5	18 - 420
Tetrachloroethylene	153	97	0.014 - 2,100
Trichloroethylene	149	66	0.01 - 680
cis-1,2-Dichloroethylene	152	14	0.0086 - 77
1,2,3-Trichlorobenzene	89	3	0.041 - 5.5
1,2,4-Trichlorobenzene	89	7	0.048 - 1,300
1,3-Dichlorobenzene	89	1	0.0086
1,4-Dichlorobenzene	89	3	0.0057 - 4.4
Methylene Chloride	152	2	0.05 - 0.35
Toluene	152	3	0.005 - 0.26

mg/kg = milligrams per kilogram

TABLE 3-2
SUMMARY OF SOIL ANALYSIS (VOCs)
1986 - 1987 MEREDITH/BOLI & ASSOCIATES AND 1996 TERRANEXT ASSESSMENTS
4144 GLENCOE AVENUE SITE
LOS ANGELES, CALIFORNIA

Boring No.	Depth (ft)	Concentration (mg/kg)								
		PCE	TCE	methylene chloride	toluene	cis-1,2 DCE	1,2,3-TCB	1,2,4-TCB	1,3-DCB	1,4-DCB
BH-1	1.0	NA	NA	NA	NA	(0.05)	NA	NA	NA	NA
	1.5	3.3	0.54	0.35	(0.05)	(0.05)	NA	NA	NA	NA
	15.0	2.2	1.6	(0.05)	0.26	(0.05)	NA	NA	NA	NA
	30.0	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	NA	NA	NA	NA
BH-2	1.0	NA	NA	NA	NA	(0.05)	NA	NA	NA	NA
	1.5	0.45	0.4	0.05	(0.05)	(0.05)	NA	NA	NA	NA
	15.0	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	NA	NA	NA	NA
	30.0	0.2	(0.05)	(0.05)	(0.05)	(0.05)	NA	NA	NA	NA
BH-3	1.5	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH-4	1.5	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH-5	0.5	(0.05)	(0.05)	(0.5)	(0.5)	(0.05)	NA	NA	NA	NA
	3.0	(0.05)	(0.05)	(0.5)	(0.5)	(0.05)	NA	NA	NA	NA
	6.0	(0.05)	(0.05)	(0.5)	(0.5)	(0.5)	NA	NA	NA	NA
	9.0	(0.05)	(0.05)	(0.5)	(0.5)	(0.5)	NA	NA	NA	NA
	18.0	(0.05)	(0.05)	(0.5)	(0.5)	(0.5)	NA	NA	NA	NA
	21.0	(0.05)	0.07	(0.5)	(0.5)	(0.05)	NA	NA	NA	NA
BH-6	0.5	20	(12.5)	(125)	(125)	(12.5)	NA	NA	NA	NA
	3.0	500	(125)	(1,250)	(1,250)	(125)	NA	NA	NA	NA
	6.0	1.3	(1.25)	(12.5)	(12.5)	(12.5)	NA	NA	NA	NA
	9.0	5	(1.25)	(12.5)	(12.5)	(12.5)	NA	NA	NA	NA
	12.0	(0.05)	(0.05)	(0.5)	(0.5)	(0.5)	NA	NA	NA	NA
	15.0	(0.05)	(0.05)	(0.5)	(0.5)	(0.5)	NA	NA	NA	NA
	18.0	(0.05)	(0.05)	(0.5)	(0.5)	(0.5)	NA	NA	NA	NA
	21.0	0.1	1.0	(0.5)	(0.5)	(0.5)	NA	NA	NA	NA

PCE = Tetrachloroethylene
TCE = Trichloroethylene
cis-1,2-DCE = cis-1,2-Dichloroethylene

1,2,3-TCB = 1,2,3-Trichlorobenzene
1,2,4-TCB = 1,2,4-Trichlorobenzene

1,3-DCB = 1,3-Dichlorobenzene
1,4-DCB = 1,4-Dichlorobenzene

mg/kg = milligrams per kilogram
NA = Sample not analyzed for associated PCB.
() = Not detected at concentration.

TABLE 3-2 (continued)
SUMMARY OF SOIL ANALYSIS (VOCs)
1986 - 1987 MEREDITH/BOLI & ASSOCIATES AND 1996 TERRANEXT ASSESSMENTS
4144 GLENCOE AVENUE SITE
LOS ANGELES, CALIFORNIA

Boring No.	Depth (ft)	Concentration (mg/kg)								
		PCE	TCE	methylene chloride	toluene	cis-1,2 DCE	1,2,3-TCB	1,2,4-TCB	1,3-DCB	1,4-DCB
BH-7	0.5	(0.05)	(0.05)	(0.05)	(0.05)	(0.5)	NA	NA	NA	NA
	3.0	(0.05)	(0.05)	(0.05)	(0.05)	(0.5)	NA	NA	NA	NA
	6.0	200	(12.5)	(125)	(125)	(12.5)	NA	NA	NA	NA
	9.0	21	(12.5)	(125)	(125)	(12.5)	NA	NA	NA	NA
	12.0	13	4	(12.5)	(12.5)	(1.25)	NA	NA	NA	NA
	15.0	1,300	(125)	(1,250)	(1,250)	(125)	NA	NA	NA	NA
	18.0	2,100	120	(1,000)	(1,000)	(100)	NA	NA	NA	NA
	21.0	180	(125)	(1,250)	(1,250)	(125)	NA	NA	NA	NA
	24.0	50	(12.5)	(125)	(125)	(12.5)	NA	NA	NA	NA
BH-8	0.5	(0.05)	(0.05)	(0.5)	(0.5)	(0.05)	NA	NA	NA	NA
	3.0	(0.05)	(0.05)	(0.5)	(0.5)	(0.05)	NA	NA	NA	NA
	6.0	(0.05)	(0.05)	(0.5)	(0.5)	(0.05)	NA	NA	NA	NA
	9.0	(0.05)	(0.05)	(0.5)	(0.5)	(0.05)	NA	NA	NA	NA
	21.0	(0.05)	(0.05)	(0.5)	(0.5)	(0.05)	NA	NA	NA	NA
BH-9	0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA
	3.0	NA	NA	NA	NA	NA	NA	NA	NA	NA
	9.0	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	NA	NA	NA	NA
	15.0	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH-10	0.5	140	(125)	(1,250)	(1,250)	(125)	NA	NA	NA	NA
	3.0	1,100	130	(1,250)	(1,250)	(125)	NA	NA	NA	NA
	6.0	120	(12.5)	(125)	(125)	(12.5)	NA	NA	NA	NA
	9.0	(0.05)	(0.05)	(0.5)	(0.5)	(0.05)	NA	NA	NA	NA
	12.0	(0.05)	(0.05)	(0.5)	(0.5)	(0.05)	NA	NA	NA	NA
	15.0	(0.05)	(0.05)	(0.5)	(0.5)	(0.05)	NA	NA	NA	NA
	18.0	(0.05)	(0.05)	(0.5)	(0.5)	(0.05)	NA	NA	NA	NA
	21.0	0.05	(0.05)	(0.5)	(0.5)	(0.05)	NA	NA	NA	NA

PCE = Tetrachloroethylene
TCE = Trichloroethylene
cis-1,2-DCE = cis-1,2-Dichloroethylene

1,2,3-TCB = 1,2,3-Trichlorobenzene
1,2,4-TCB = 1,2,4-Trichlorobenzene

1,3-DCB = 1,3-Dichlorobenzene
1,4-DCB = 1,4-Dichlorobenzene

mg/kg = milligrams per kilogram
NA = Sample not analyzed for associated PCB.
() = Not detected at concentration.

TABLE 3-2 (continued)
SUMMARY OF SOIL ANALYSIS (VOCs)
1986 - 1987 MEREDITH/BOLI & ASSOCIATES AND 1996 TERRANEXT ASSESSMENTS
4144 GLENCOE AVENUE SITE
LOS ANGELES, CALIFORNIA

Boring No.	Depth (ft)	Concentration (mg/kg)								
		PCE	TCE	methylene chloride	toluene	cis-1,2 DCE	1,2,3-TCB	1,2,4-TCB	1,3-DCB	1,4-DCB
BH-11	0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA
	3.0	NA	NA	NA	NA	NA	NA	NA	NA	NA
	9.0	NA	NA	NA	NA	NA	NA	NA	NA	NA
	15.0	NA	NA	NA	NA	NA	NA	NA	NA	NA
	21.0	(0.05)	(0.05)	(0.5)	(0.5)	(0.05)	NA	NA	NA	NA
BH-12	0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA
	3.0	NA	NA	NA	NA	NA	NA	NA	NA	NA
	9.0	NA	NA	NA	NA	NA	NA	NA	NA	NA
	15.0	NA	NA	NA	NA	NA	NA	NA	NA	NA
	18.0	(0.05)	(0.05)	(0.5)	(0.5)	(0.05)	NA	NA	NA	NA
BH-13	0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA
	3.0	NA	NA	NA	NA	NA	NA	NA	NA	NA
	15.0	NA	NA	NA	NA	NA	NA	NA	NA	NA
	19.0	(0.05)	(0.05)	(0.5)	(0.5)	(0.5)	NA	NA	NA	NA
BH-14	0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA
	3.0	NA	NA	NA	NA	NA	NA	NA	NA	NA
	9.0	NA	NA	NA	NA	NA	NA	NA	NA	NA
	15.0	NA	NA	NA	NA	NA	NA	NA	NA	NA
	21.0	(0.05)	(0.05)	(0.5)	(0.5)	(0.05)	NA	NA	NA	NA
BH-15	0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA
	3.0	NA	NA	NA	NA	NA	NA	NA	NA	NA
	9.0	(0.05)	(0.05)	(0.5)	(0.5)	(0.05)	NA	NA	NA	NA
	15.0	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH-16	0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA
	3.0	NA	NA	NA	NA	NA	NA	NA	NA	NA
	9.0	(0.05)	(0.05)	(0.5)	(0.5)	(0.05)	NA	NA	NA	NA
	15.0	NA	NA	NA	NA	NA	NA	NA	NA	NA

PCE = Tetrachloroethylene
TCE = Trichloroethylene
cis-1,2-DCE = cis-1,2-Dichloroethylene

1,2,3-TCB = 1,2,3-Trichlorobenzene
1,2,4-TCB = 1,2,4-Trichlorobenzene

1,3-DCB = 1,3-Dichlorobenzene
1,4-DCB = 1,4-Dichlorobenzene

mg/kg = milligrams per kilogram
NA = Sample not analyzed for associated PCB.
() = Not detected at concentration.

TABLE 3-2 (continued)
SUMMARY OF SOIL ANALYSIS (VOCs)
1986 - 1987 MEREDITH/BOLI & ASSOCIATES AND 1996 TERRANEXT ASSESSMENTS
4144 GLENCOE AVENUE SITE
LOS ANGELES, CALIFORNIA

Boring No.	Depth (ft)	Concentration (mg/kg)								
		PCE	TCE	methylene chloride	toluene	cis-1,2 DCE	1,2,3-TCB	1,2,4-TCB	1,3-DCB	1,4-DCB
BH-17	0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA
	3.0	NA	NA	NA	NA	NA	NA	NA	NA	NA
	9.0	NA	NA	NA	NA	NA	NA	NA	NA	NA
	15.0	(0.05)	(0.05)	(0.5)	(0.5)	(0.05)	NA	NA	NA	NA
BH-18	0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA
	3.0	NA	NA	NA	NA	NA	NA	NA	NA	NA
	15.0	(0.05)	(0.05)	(0.5)	(0.5)	(0.05)	NA	NA	NA	NA
	18.0	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH-19	0.5	18	(12.5)	(12.5)	(12.5)	(1.25)	NA	NA	NA	NA
	3.0	20	(12.5)	(12.5)	(12.5)	(1.25)	NA	NA	NA	NA
	6.0	0.42	(0.05)	(0.5)	(0.5)	(0.05)	NA	NA	NA	NA
	9.0	(0.05)	(0.05)	(0.5)	(0.5)	(0.05)	NA	NA	NA	NA
	12.0	(0.05)	(0.05)	(0.5)	(0.5)	(0.05)	NA	NA	NA	NA
	15.0	490	31	(12.5)	(12.5)	(1.25)	NA	NA	NA	NA
	18.0	770	38	(12.5)	(12.5)	(1.25)	NA	NA	NA	NA
	21.0	0.06	0.1	(0.5)	(0.5)	(0.05)	NA	NA	NA	NA
BH-20	0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA
	3.0	NA	NA	NA	NA	NA	NA	NA	NA	NA
	9.0	NA	NA	NA	NA	NA	NA	NA	NA	NA
	15.0	NA	NA	NA	NA	NA	NA	NA	NA	NA
	21.0	(0.05)	(0.05)	(0.5)	(0.5)	(0.05)	NA	NA	NA	NA

PCE = Tetrachloroethylene
TCE = Trichloroethylene
cis-1,2-DCE = cis-1,2-Dichloroethylene

1,2,3-TCB = 1,2,3-Trichlorobenzene
1,2,4-TCB = 1,2,4-Trichlorobenzene

1,3-DCB = 1,3-Dichlorobenzene
1,4-DCB = 1,4-Dichlorobenzene

mg/kg = milligrams per kilogram
NA = Sample not analyzed for associated PCB.
() = Not detected at concentration.

TABLE 3-2 (continued)
SUMMARY OF SOIL ANALYSIS (VOCs)
1986 - 1987 MEREDITH/BOLI & ASSOCIATES AND 1996 TERRANEXT ASSESSMENTS
4144 GLENCOE AVENUE SITE
LOS ANGELES, CALIFORNIA

Boring No.	Depth (ft)	Concentration (mg/kg)								
		PCE	TCE	methylene chloride	toluene	cis-1,2 DCE	1,2,3-TCB	1,2,4-TCB	1,3-DCB	1,4-DCB
BH-21	0.5	0.26	(0.025)	(0.075)	(0.025)	(0.025)	(0.025)	(0.025)	(0.025)	(0.025)
	3.0	0.033	0.0087	(0.015)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
	12.5	0.51	0.17	(0.075)	(0.025)	(0.025)	(0.025)	(0.025)	(0.025)	(0.025)
	15.0	0.18	0.085	(0.015)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
	20.0	0.46	0.3	(0.075)	(0.025)	(0.025)	(0.025)	(0.025)	(0.025)	(0.025)
	25.0	0.16	0.051	(0.015)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
	30.0	0.026	(0.005)	(0.015)	(0.005)	(0.005)	(0.005)	0.048	(0.005)	(0.005)
	31.5	0.16	0.1	(0.075)	(0.025)	(0.025)	(0.025)	(0.025)	(0.025)	(0.025)
BH-22	0.5	830	680	(150)	(50)	(50)	(50)	1,300	(50)	(50)
	3.0	13	1	(1.875)	(0.625)	(0.6)	5.5	18	(0.6)	(0.6)
	10.0	0.036	0.025	(0.015)	(0.005)	(0.005)	0.041	0.15	(0.005)	(0.005)
	12.5	0.27	(0.010)	(0.030)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
	15.0	0.15	0.1	(0.075)	(0.025)	(0.025)	(0.025)	(0.025)	(0.025)	(0.025)
	20.0	0.69	0.39	(0.075)	(0.025)	(0.025)	(0.025)	(0.025)	(0.025)	(0.025)
	25.0	0.022	0.018	(0.015)	(0.005)	(0.005)	(0.005)	0.038	(0.005)	(0.005)
	30.0	0.034	(0.010)	(0.030)	(0.010)	(0.010)	0.068	0.2	(0.010)	(0.010)
BH-23	31.5	0.019	0.018	(0.015)	(0.005)	(0.005)	(0.005)	0.093	(0.005)	(0.005)
	0.5	(0.6)	(0.6)	(1.875)	(0.625)	8.9	(0.6)	(0.6)	(0.6)	4.4
	3.0	(0.005)	(0.005)	(0.015)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	0.0057
	10.0	0.19	0.099	(0.015)	(0.005)	0.097	(0.005)	(0.005)	0.0086	0.084
	12.5	0.11	0.091	(0.015)	(0.005)	0.038	(0.005)	(0.005)	(0.005)	(0.005)
	15.0	0.18	0.1	(0.015)	(0.005)	0.048	(0.005)	(0.005)	(0.005)	(0.005)
	20.0	0.05	0.032	(0.015)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
	25.0	0.2	0.052	(0.075)	(0.025)	(0.025)	(0.025)	(0.025)	(0.025)	(0.025)
	30.0	0.01	(0.005)	(0.015)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
	34.5	0.019	0.0086	(0.015)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)

PCE = Tetrachloroethylene
TCE = Trichloroethylene
cis-1,2-DCE = cis-1,2-Dichloroethylene

1,2,3-TCB = 1,2,3-Trichlorobenzene
1,2,4-TCB = 1,2,4-Trichlorobenzene

1,3-DCB = 1,3-Dichlorobenzene
1,4-DCB = 1,4-Dichlorobenzene

mg/kg = milligrams per kilogram
NA = Sample not analyzed for associated PCB.
() = Not detected at concentration.

TABLE 3-2 (continued)
SUMMARY OF SOIL ANALYSIS (VOCs)
1986 - 1987 MEREDITH/BOLI & ASSOCIATES AND 1996 TERRANEXT ASSESSMENTS
4144 GLENCOE AVENUE SITE
LOS ANGELES, CALIFORNIA

Boring No.	Depth (ft)	Concentration (mg/kg)								
		PCE	TCE	methylene chloride	toluene	cis-1,2 DCE	1,2,3-TCB	1,2,4-TCB	1,3-DCB	1,4-DCB
BH-24	0.5	230	410	(37.5)	(12.5)	77	(12.5)	(12.5)	(12.5)	(12.5)
	6.0	(0.005)	0.0058	(0.015)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
	10.0	280	18	(37.5)	(12.5)	(12.5)	(12.5)	(12.5)	(12.5)	(12.5)
	12.5	0.074	0.078	(0.015)	(0.005)	0.066	(0.005)	(0.005)	(0.005)	(0.005)
	15.0	0.013	(0.005)	(0.015)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
	20.5	0.087	(0.010)	(0.030)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
	25.0	(0.005)	0.02	(0.015)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
	30.0	0.028	0.026	(0.015)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
BH-25	0.5	0.024	0.0052	(0.015)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
	3.0	0.077	0.029	(0.015)	(0.005)	0.086	(0.005)	(0.005)	(0.005)	(0.005)
	14.0	0.018	(0.010)	(0.030)	(0.010)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
	15.0	0.024	0.013	(0.030)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
	20.0	0.72	(0.6)	(1.875)	(0.625)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
	25.0	0.054	0.053	--	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
	30.0	0.012	0.01	(0.015)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
BH-26	0.5	0.068	0.061	(0.015)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
	3.0	0.014	0.0076	(0.015)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
	10.0	(0.005)	(0.005)	(0.015)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
	12.5	0.19	0.076	(0.075)	(0.025)	(0.025)	(0.025)	(0.025)	(0.025)	(0.025)
	20.0	0.92	(0.0625)	(1.875)	(0.625)	(0.625)	(0.625)	(0.625)	(0.625)	(0.625)
	26.0	0.039	0.096	(0.015)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
	30.0	0.059	(0.005)	(0.015)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)

PCE = Tetrachloroethylene
TCE = Trichloroethylene
cis-1,2-DCE = cis-1,2-Dichloroethylene

1,2,3-TCB = 1,2,3-Trichlorobenzene
1,2,4-TCB = 1,2,4-Trichlorobenzene

1,3-DCB = 1,3-Dichlorobenzene
1,4-DCB = 1,4-Dichlorobenzene

mg/kg = milligrams per kilogram
NA = Sample not analyzed for associated PCB.
() = Not detected at concentration.

TABLE 3-2 (continued)
SUMMARY OF SOIL ANALYSIS (VOCs)
1986 - 1987 MEREDITH/BOLI & ASSOCIATES AND 1996 TERRANEXT ASSESSMENTS
4144 GLENCOE AVENUE SITE
LOS ANGELES, CALIFORNIA

Boring No.	Depth (ft)	Concentration (mg/kg)								
		PCE	TCE	methylene chloride	toluene	cis-1,2 DCE	1,2,3-TCB	1,2,4-TCB	1,3-DCB	1,4-DCB
BH-27	0.5	0.12	0.031	(0.015)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
	3.0	0.075	0.021	(0.015)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
	10.0	(0.005)	(0.005)	(0.015)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
	15.5	0.026	0.035	(0.015)	(0.005)	0.0076	(0.005)	(0.005)	(0.005)	(0.005)
	20.0	0.14	0.13	(0.015)	(0.005)	0.023	(0.005)	(0.005)	(0.005)	(0.005)
	25.0	0.006	(0.005)	(0.015)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
	30.0	0.024	0.015	(0.015)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
BH-28	0.5	0.03	0.01	(0.015)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
	3.0	(0.005)	(0.005)	(0.015)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
	10.0	0.0086	(0.005)	(0.015)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
	15.5	(0.005)	(0.005)	(0.015)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
BH-29	0.5	(0.005)	(0.005)	(0.015)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
	5.0	0.022	0.0056	(0.015)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
	10.5	(0.005)	(0.005)	(0.015)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
	12.5	0.18	0.15	(0.015)	(0.005)	0.071	(0.005)	(0.005)	(0.005)	(0.005)
	15.0	(0.005)	(0.005)	(0.015)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
	20.0	(0.005)	(0.005)	(0.015)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
BH-30	0.5	(0.005)	(0.005)	(0.015)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
	4.5	(0.005)	(0.005)	(0.015)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
	10.0	(0.005)	(0.005)	(0.015)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
	12.5	(0.005)	(0.005)	(0.015)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
BH-31	0.5	0.083	0.011	(0.015)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
	5.0	0.0091	(0.005)	(0.015)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
	10.0	(0.005)	(0.005)	(0.015)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
	12.5	(0.005)	(0.005)	(0.015)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
	15.0	(0.005)	(0.005)	(0.015)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
	20.0	0.0094	(0.005)	(0.015)	(0.005)	0.0068	(0.005)	(0.005)	(0.005)	(0.005)

PCE = Tetrachloroethylene
TCE = Trichloroethylene
cis-1,2-DCE = cis-1,2-Dichloroethylene

1,2,3-TCB = 1,2,3-Trichlorobenzene
1,2,4-TCB = 1,2,4-Trichlorobenzene

1,3-DCB = 1,3-Dichlorobenzene
1,4-DCB = 1,4-Dichlorobenzene

mg/kg = milligrams per kilogram
NA = Sample not analyzed for associated PCB.
() = Not detected at concentration.

TABLE 3-2 (continued)
SUMMARY OF SOIL ANALYSIS (VOCs)
1986 - 1987 MEREDITH/BOLI & ASSOCIATES AND 1996 TERRANEXT ASSESSMENTS
4144 GLENCOE AVENUE SITE
LOS ANGELES, CALIFORNIA

Boring No.	Depth (ft)	Concentration (mg/kg)								
		PCE	TCE	methylene chloride	toluene	cis-1,2 DCE	1,2,3-TCB	1,2,4-TCB	1,3-DCB	1,4-DCB
BH-32	0.5	0.0054	(0.005)	(0.015)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
	3.0	(0.005)	(0.005)	(0.015)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
	10.0	(0.005)	(0.005)	(0.015)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
	12.5	(0.005)	(0.005)	(0.015)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
BH-33	0.5	0.049	0.025	(0.015)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
	5.0	0.014	(0.005)	(0.015)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
	10.0	0.021	0.02	(0.015)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
	12.5	0.02	0.034	(0.015)	(0.005)	0.018	(0.005)	(0.005)	(0.005)	(0.005)
	20.0	0.103	0.17	(0.015)	(0.005)	0.088	(0.005)	(0.005)	(0.005)	(0.005)
BH-34	0.5	0.37	0.177	(0.015)	(0.005)	0.026	(0.005)	(0.005)	(0.005)	(0.005)
	5.0	0.036	0.013	(0.015)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
	10.0	0.019	0.019	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
	12.5	0.022	0.031	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
	20.0	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)

PCE = Tetrachloroethylene
TCE = Trichloroethylene
cis-1,2-DCE = cis-1,2-Dichloroethylene

1,2,3-TCB = 1,2,3-Trichlorobenzene
1,2,4-TCB = 1,2,4-Trichlorobenzene

1,3-DCB = 1,3-Dichlorobenzene
1,4-DCB = 1,4-Dichlorobenzene

mg/kg = milligrams per kilogram
NA = Sample not analyzed for associated PCB.
() = Not detected at concentration.

TABLE 3-3
SUMMARY OF SOIL ANALYSIS (PCBs)
1986 - 1987 MEREDITH/BOLI & ASSOCIATES AND 1996 TERRANEXT ASSESSMENTS
4144 GLENCOE AVENUE SITE
LOS ANGELES, CALIFORNIA

Boring No.	Depth (ft)	Concentrations (mg/kg)	
		Arochlor 1248	Arochlor 1254
BH-1	1.0	(10)	300
	1.5	(10)	160
	15.0	(10)	1,200
	30.0	(4)	120
BH-2	1.0	(0.1)	(0.1)
	1.5	(2)	130
	15.0	(0.1)	(0.1)
	30.0	(1)	5.6
BH-3	1.5	(1)	5.6
BH-4	1.5	(2)	14
BH-5	0.5	(0.1)	0.2
	3.0	(0.1)	(0.1)
	6.0	(0.1)	0.4
	9.0	(0.1)	0.4
	18.0	(0.1)	(0.1)
	21.0	(0.1)	(0.1)
BH-6	0.5	(100)	1,100
	3.0	(100)	2,300
	6.0	(20)	640
	9.0	(20)	670
	12.0	(0.1)	0.4
	15.0	(0.1)	0.6
	18.0	(0.1)	0.7
	21.0	(0.1)	1.1

PCBs = Polychlorinated Biphenyls

mg/kg = milligrams per kilogram

NA = Sample not analyzed for associated PCB.

() = Not detected at concentration.

TABLE 3-3 (continued)
SUMMARY OF SOIL ANALYSIS (PCBs)
1986 - 1987 MEREDITH/BOLI & ASSOCIATES AND 1996 TERRANEXT ASSESSMENTS
4144 GLENCOE AVENUE SITE
LOS ANGELES, CALIFORNIA

Boring No.	Depth (ft)	Concentrations (mg/kg)	
		Arochlor 1248	Arochlor 1254
BH-7	0.5	(0.1)	(0.1)
	3.0	(0.1)	1.3
	6.0	(2)	34
	9.0	(100)	2,400
	12.0	(20)	590
	15.0	(20)	2,100
	18.0	(20)	1,000
	21.0	(20)	200
BH-8	24.0	(20)	1,200
	0.5	(0.1)	(0.1)
	3.0	(0.1)	(0.1)
	6.0	(0.1)	(0.1)
	9.0	(0.1)	(0.1)
BH-9	21.0	(0.1)	(0.1)
	0.5	(0.1)	(0.1)
	3.0	(0.1)	(0.1)
	9.0	(0.1)	(0.1)
BH-10	15.0	(0.1)	(0.1)
	0.5	2,500	420
	3.0	1,300	(100)
	6.0	410	(20)
	9.0	(0.1)	1.3
	12.0	(0.1)	0.7
	15.0	(0.2)	0.4
	18.0	(0.2)	0.3
	21.0	(0.2)	0.4

PCBs = Polychlorinated Biphenyls

mg/kg = milligrams per kilogram

NA = Sample not analyzed for associated PCB.

() = Not detected at concentration.

TABLE 3-3 (continued)
SUMMARY OF SOIL ANALYSIS (PCBs)
1986 - 1987 MEREDITH/BOLI & ASSOCIATES AND 1996 TERRANEXT ASSESSMENTS
4144 GLENCOE AVENUE SITE
LOS ANGELES, CALIFORNIA

Boring No.	Depth (ft)	Concentrations (mg/kg)	
		Arochlor 1248	Arochlor 1254
BH-11	0.5	(0.1)	0.2
	3.0	(0.1)	(0.1)
	9.0	(0.1)	(0.1)
	15.0	(0.1)	(0.1)
	21.0	NA	NA
BH-12	0.5	(0.1)	0.5
	3.0	(0.1)	1.4
	9.0	(0.1)	0.3
	15.0	(0.1)	(0.1)
	18.0	NA	NA
BH-13	1.50.5	(0.1)	(0.1)
	3.0	(0.1)	(0.1)
	15.0	(0.1)	(0.1)
	19.0	(0.1)	(0.1)
BH-14	0.5	(0.1)	(0.1)
	3.0	(0.1)	(0.1)
	9.0	(0.1)	(0.1)
	15.0	(0.1)	(0.1)
	21.0	NA	NA
BH-15	0.5	(0.1)	(0.1)
	3.0	(0.1)	(0.1)
	9.0	(0.1)	(0.1)
	15.0	(0.1)	(0.1)
BH-16	0.5	(0.1)	(0.1)
	3.0	(0.1)	(0.1)
	9.0	(0.1)	(0.1)
	15.0	(0.1)	(0.1)

PCBs = Polychlorinated Biphenyls

mg/kg = milligrams per kilogram

NA = Sample not analyzed for associated PCB.

() = Not detected at concentration.

TABLE 3-3 (continued)
SUMMARY OF SOIL ANALYSIS (PCBs)
1986 - 1987 MEREDITH/BOLI & ASSOCIATES AND 1996 TERRANEXT ASSESSMENTS
4144 GLENCOE AVENUE SITE
LOS ANGELES, CALIFORNIA

Boring No.	Depth (ft)	Concentrations (mg/kg)	
		Arochlor 1248	Arochlor 1254
BH-17	0.5	(0.1)	(0.1)
	3.0	(0.1)	(0.1)
	9.0	(0.1)	(0.1)
	15.0	(0.1)	(0.1)
BH-18	0.5	(0.1)	(0.1)
	3.0	(0.1)	0.3
	12.0	NA	NA
	15.0	(0.1)	(0.1)
BH-19	0.5	130	34
	3.0	230	93
	6.0	(2)	120
	9.0	(2)	86
	12.0	(0.1)	0.6
	15.0	63	17
	18.0	230	39
	21.0	18	(0.1)
BH-20	0.5	(0.1)	(0.1)
	3.0	(0.1)	(0.1)
	9.0	(0.1)	(0.1)
	15.0	(0.1)	(0.1)
	21.0	NA	NA

PCBs = Polychlorinated Biphenyls

mg/kg = milligrams per kilogram

NA = Sample not analyzed for associated PCB.

() = Not detected at concentration.

TABLE 3-3 (continued)
SUMMARY OF SOIL ANALYSIS (PCBs)
1986 - 1987 MEREDITH/BOLI & ASSOCIATES AND 1996 TERRANEXT ASSESSMENTS
4144 GLENCOE AVENUE SITE
LOS ANGELES, CALIFORNIA

Boring No.	Depth (ft)	Concentrations (mg/kg)	
		Arochlor 1248	Arochlor 1254
BH-21	0.5	(3.3)	17
	3.0	(0.033)	0.36
	12.5	(0.033)	0.5
	15.0	(0.033)	0.083
	20.0	(0.033)	0.1
	25.0	(0.6)	12
	30.0	(0.3)	3.5
	31.5	(0.3)	6.2
BH-22	0.5	(330)	1,800
	3.0	(330)	600
	10.0	(8.25)	35
	12.5	(1.6)	4.1
	15.0	(0.3)	2.3
	20.0	(0.16)	0.7
	25.0	(1.6)	3.6
	30.0	(8.25)	31
BH-23	31.5	(33)	52
	0.5	(165)	1,200
	3.0	(0.16)	1.5
	10.0	(16.5)	90
	12.5	(0.033)	0.27
	15.0	(0.066)	0.82
	20.0	(0.033)	0.086
	25.0	(3.3)	19
	30.0	(0.3)	4.1
	34.5	(0.033)	0.52

PCBs = Polychlorinated Biphenyls

mg/kg = milligrams per kilogram

NA = Sample not analyzed for associated PCB.

() = Not detected at concentration.

TABLE 3-3 (continued)
SUMMARY OF SOIL ANALYSIS (PCBs)
1986 - 1987 MEREDITH/BOLI & ASSOCIATES AND 1996 TERRANEXT ASSESSMENTS
4144 GLENCOE AVENUE SITE
LOS ANGELES, CALIFORNIA

Boring No.	Depth (ft)	Concentrations (mg/kg)	
		Arochlor 1248	Arochlor 1254
BH-24	0.5	(0.3)	5.7
	6.0	(0.033)	0.45
	10.0	(0.6)	(0.6)
	12.5	(0.033)	(0.033)
	15.0	(0.6)	(0.6)
	20.5	(0.033)	0.043
	25.0	(0.033)	0.56
	30.0	(0.033)	0.36
BH-25	0.5	(0.1)	2
	3.0	(0.033)	0.065
	14.0	(0.033)	(0.033)
	15.0	(0.033)	1.1
	20.0	(0.6)	3.2
	25.0	(0.033)	0.29
	30.0	(0.033)	0.057
BH-26	0.5	(0.1)	0.4
	3.0	(0.033)	0.052
	10.0	(0.033)	(0.033)
	12.5	(0.033)	(0.033)
	20.0	(0.033)	(0.033)
	26.0	(0.033)	0.039
	30.0	(0.033)	0.37
BH-27	15.5	(1.6)	9.9
	20.0	(0.033)	(0.033)
	25.0	(0.1)	1.1
	30.0	(0.033)	(0.033)

PCBs = Polychlorinated Biphenyls

mg/kg = milligrams per kilogram

NA = Sample not analyzed for associated PCB.

() = Not detected at concentration.

TABLE 3-3 (continued)
SUMMARY OF SOIL ANALYSIS (PCBs)
1986 - 1987 MEREDITH/BOLI & ASSOCIATES AND 1996 TERRANEXT ASSESSMENTS
4144 GLENCOE AVENUE SITE
LOS ANGELES, CALIFORNIA

Boring No.	Depth (ft)	Concentrations (mg/kg)	
		Arochlor 1248	Arochlor 1254
BH-28	0.5	(0.033)	0.046
	3.0	(0.033)	0.056
	10.0	(0.033)	0.2
	15.5	(0.033)	0.071
BH-29	0.5	(0.3)	1.9
	5.0	(0.033)	0.4
	10.5	(0.033)	(0.033)
	12.5	(0.033)	(0.033)
	15.0	(0.033)	0.05
	20.0	(0.033)	(0.033)
BH-30	0.5	(0.033)	(0.033)
	4.5	(0.033)	0.072
	10.0	(0.6)	4.1
	12.5	(0.033)	(0.033)
BH-31	0.5	(0.033)	0.17
	5.0	(0.033)	0.21
	10.0	(0.033)	0.095
	12.5	(0.033)	(0.033)
	15.0	(0.033)	(0.033)
	20.0	(0.033)	(0.033)
BH-32	0.5	(0.033)	(0.033)
	3.0	(0.3.3)	11
	10.0	(0.033)	0.049
	12.5	(0.033)	(0.033)

PCBs = Polychlorinated Biphenyls

mg/kg = milligrams per kilogram

NA = Sample not analyzed for associated PCB.

() = Not detected at concentration.

TABLE 3-3 (continued)
SUMMARY OF SOIL ANALYSIS (PCBs)
1986 - 1987 MEREDITH/BOLI & ASSOCIATES AND 1996 TERRANEXT ASSESSMENTS
4144 GLENCOE AVENUE SITE
LOS ANGELES, CALIFORNIA

Boring No.	Depth (ft)	Concentrations (mg/kg)	
		Arochlor 1248	Arochlor 1254
BH-33	0.5	(0.033)	0.11
	5.0	(0.033)	(0.033)
	10.0	(0.033)	0.086
	12.5	(0.033)	0.073
	20.0	(0.033)	(0.033)
BH-34	0.5	(3.3)	54.0
	5.0	(0.033)	(0.033)
	10.0	(0.033)	(0.033)
	12.5	(0.033)	(0.033)
	20.0	(0.033)	(0.033)

PCBs = Polychlorinated Biphenyls

mg/kg = milligrams per kilogram

NA = Sample not analyzed for associated PCB.

() = Not detected at concentration.

TABLE 3-4
SUMMARY OF SOIL ANALYSIS (METALS)
1986 - 1987 MEREDITH/BOLI & ASSOCIATES AND 1996 TERRANEXT ASSESSMENTS
4144 GLENCOE AVENUE SITE
LOS ANGELES, CALIFORNIA

Chemical Constituent	Regulatory Limits		Boring Location and Depth (ft)		
	TTLIC	STLC	BH-10 @ 1.0	BH-22 @ 0.5	BH-27 @ 3.0
antimony	500	15	(5)	110	70
arsenic	500	5	17	(2.5)	(2.5)
barium	100,000	100	140	250	120
beryllium	75	1	1	(2.5)	(2.5)
cadmium	100	1	(0.3)	(2.5)	(2.5)
chromium ¹	NA	NA	12	47	27
cobalt	8,000	80	10	11	6
copper	2,500	25	36	62	58
lead	1,000	5	4	37	22
mercury	20	0	0	(0.20)	(0.20)
molybdenum	3,500	350	(1)	(2.5)	(2.5)
nickel	2,000	20	35	21	15
silver	500	5	(0.5)	22	13
selenium	100	1	2	0	(0.10)
thallium	700	7	(5)	190 ²	120 ²
vanadium	2,400	24	63	92	56
zinc	5,000	250	78	110	77

- Notes:
1. Total chromium
 2. Value greater than 10 times the STLC
mg/kg = milligrams per kilogram
mg/l = milligrams per liter
PCBs = Polychlorinated Biphenyls

TTLIC = Total Threshold Limit Concentration
STLC = Soluble Threshold Limit Concentration
NA = Sample not analyzed for associated PCB.
() = Not detected at concentration.

A wet extraction test (WET) for thallium was performed on soil samples collected from BH-22 @ 0.5 ft and BH-27 @ 3.0 ft. Thallium was not detected in either sample above the laboratory detection limit of 0.5 mg/L.

TABLE 3-5

**SUMMARY OF SEMI-VOLATILE CONCENTRATIONS IN SOIL SAMPLES
NOVEMBER 1998 DAMES & MOORE ASSESSMENT
4144 GLENCOE AVENUE SITE
LOS ANGELES, CALIFORNIA**

Semi-Volatile Compounds									
Boring No.	Concentrations (mg/kg)								
	Depth (ft)	1,2,4-TCB	1,2-DCB	1,3-DCB	1,4-DCB	2,2'-oxybis (1-chloro propane)	2,4,5-Trichloro phenol	2,4,6-Trichloro phenol	2,4-Dichloro phenol
SB-3	3	(0.050)	(0.050)	(0.050)	(0.050)	(0.050)	(0.10)	(0.050)	(0.050)
SB-10	3	(0.050)	(0.050)	(0.050)	(0.050)	(0.050)	(0.10)	(0.050)	(0.050)
SB-13	2.5	(0.050)	(0.050)	(0.050)	(0.050)	(0.050)	(0.10)	(0.050)	(0.050)
	3	(0.050)	(0.050)	(0.050)	(0.050)	(0.050)	(0.10)	(0.050)	(0.050)
SB-16	3	(0.050)	(0.050)	(0.050)	(0.050)	(0.050)	(0.10)	(0.050)	(0.050)
SB-18	3	(0.050)	(0.050)	(0.050)	(0.050)	(0.050)	(0.10)	(0.050)	(0.050)
SB-22	2.5	(0.050)	(0.050)	(0.050)	(0.050)	(0.050)	(0.10)	(0.050)	(0.050)
SB-25	3	(0.050)	(0.050)	(0.050)	(0.050)	(0.050)	(0.10)	(0.050)	(0.050)
SB-27	3	(0.050)	(0.050)	(0.050)	(0.050)	(0.050)	(0.10)	(0.050)	(0.050)

Notes: mg/kg = milligrams per kilogram
() = Not Detected at concentration

1,2,4-TCB = 1,2,4-Trichlorobenzene
1,2-DCB = 1,2-Dichlorobenzene

1,3-DCB = 1,3-Dichlorobenzene
1,4-DCB = 1,4-Dichlorobenzene

TABLE 3-5 (continued)

**SUMMARY OF SEMI-VOLATILE CONCENTRATIONS IN SOIL SAMPLES
NOVEMBER 1998 DAMES & MOORE ASSESSMENT
4144 GLENCOE AVENUE SITE
LOS ANGELES, CALIFORNIA**

Boring No.	Semi-Volatile Compounds								
	Concentrations (mg/kg)								
	Depth (ft)	2,4-Dimethyl phenol	2,4-Dinitro phenol	2,4-Dinitro toluene	2,6-Dinitro toluene	2-Chloro naphthalene	2-Chloro phenol	2-Methyl naphthalene	2-Methyl phenol
SB-3	3	(0.10)	(0.20)	(0.050)	(0.050)	(0.050)	(0.15)	(0.050)	(0.050)
SB-10	3	(0.10)	(0.20)	(0.050)	(0.050)	(0.050)	(0.15)	(0.050)	(0.050)
SB-13	2.5	(0.10)	(0.20)	(0.050)	(0.050)	(0.050)	(0.15)	(0.050)	(0.050)
	3	(0.10)	(0.20)	(0.050)	(0.050)	(0.050)	(0.15)	(0.050)	(0.050)
SB-16	3	(0.10)	(0.20)	(0.050)	(0.050)	(0.050)	(0.15)	(0.050)	(0.050)
SB-18	3	(0.10)	(0.20)	(0.050)	(0.050)	(0.050)	(0.15)	(0.050)	(0.050)
SB-22	2.5	(0.10)	(0.20)	(0.050)	(0.050)	(0.050)	(0.15)	(0.050)	(0.050)
SB-25	3	(0.10)	(0.20)	(0.050)	(0.050)	(0.050)	(0.15)	(0.050)	(0.050)
SB-27	3	(0.10)	(0.20)	(0.050)	(0.050)	(0.050)	(0.15)	(0.050)	(0.050)

Notes: mg/kg = milligrams per kilogram

() = Not Detected at concentration

1,2,4-TCB = 1,2,4-Trichlorobenzene
1,2-DCB = 1,2-Dichlorobenzene

1,3-DCB = 1,3-Dichlorobenzene
1,4-DCB = 1,4-Dichlorobenzene

TABLE 3-5 (continued)

**SUMMARY OF SEMI-VOLATILE CONCENTRATIONS IN SOIL SAMPLES
NOVEMBER 1998 DAMES & MOORE ASSESSMENT
4144 GLENCOE AVENUE SITE
LOS ANGELES, CALIFORNIA**

Semi-Volatile Compounds									
Boring No.	Concentrations (mg/kg)								
	Depth (ft)	2-Nitro aniline	2-Nitro phenol	3,3'-Dichloro benzidine	3-Nitro aniline	3/4-Methyl phenol	4,6-Dinitro -2-methyl phenol	4-Bromo phenyl phenylether	4-Chloro-3-methyl phenol
SB-3	3	(0.20)	(0.050)	(0.20)	(0.20)	(0.050)	(0.20)	(0.050)	(0.050)
SB-10	3	(0.20)	(0.050)	(0.20)	(0.20)	(0.050)	(0.20)	(0.050)	(0.050)
SB-13	2.5	(0.20)	(0.050)	(0.20)	(0.20)	(0.050)	(0.20)	(0.050)	(0.050)
	3	(0.20)	(0.050)	(0.20)	(0.20)	(0.050)	(0.20)	(0.050)	(0.050)
SB-16	3	(0.20)	(0.050)	(0.20)	(0.20)	(0.050)	(0.20)	(0.050)	(0.050)
SB-18	3	(0.20)	(0.050)	(0.20)	(0.20)	(0.050)	(0.20)	(0.050)	(0.050)
SB-22	2.5	(0.20)	(0.050)	(0.20)	(0.20)	(0.050)	(0.20)	(0.050)	(0.050)
SB-25	3	(0.20)	(0.050)	(0.20)	(0.20)	(0.050)	(0.20)	(0.050)	(0.050)
SB-27	3	(0.20)	(0.050)	(0.20)	(0.20)	(0.050)	(0.20)	(0.050)	(0.050)

Notes: mg/kg = milligrams per kilogram
() = Not Detected at concentration

1,2,4-TCB = 1,2,4-Trichlorobenzene
1,2-DCB = 1,2-Dichlorobenzene

1,3-DCB = 1,3-Dichlorobenzene
1,4-DCB = 1,4-Dichlorobenzene

TABLE 3-5 (continued)

**SUMMARY OF SEMI-VOLATILE CONCENTRATIONS IN SOIL SAMPLES
NOVEMBER 1998 DAMES & MOORE ASSESSMENT
4144 GLENCOE AVENUE SITE
LOS ANGELES, CALIFORNIA**

Semi-Volatile Compounds									
Boring No.	Concentrations (mg/kg)								
	Depth (ft)	4-Chloro aniline	4-Chloro phenyl phenyl ether	4-Nitroaniline	4-Nitrophenol	Acenaphthene	Acenaphthylene	Athracene	Benzo(a)anthracene
SB-3	3	(0.15)	(0.050)	(0.20)	(0.20)	(0.050)	(0.050)	(0.050)	(0.050)
SB-10	3	(0.15)	(0.050)	(0.20)	(0.20)	(0.050)	(0.050)	(0.050)	(0.050)
SB-13	2.5	(0.15)	(0.050)	(0.20)	(0.20)	(0.050)	(0.050)	(0.050)	(0.050)
	3	(0.15)	(0.050)	(0.20)	(0.20)	(0.050)	(0.050)	(0.050)	(0.050)
SB-16	3	(0.15)	(0.050)	(0.20)	(0.20)	(0.050)	(0.050)	(0.050)	(0.050)
SB-18	3	(0.15)	(0.050)	(0.20)	(0.20)	(0.050)	(0.050)	(0.050)	(0.050)
SB-22	2.5	(0.15)	(0.050)	(0.20)	(0.20)	(0.050)	(0.050)	(0.050)	(0.050)
SB-25	3	(0.15)	(0.050)	(0.20)	(0.20)	(0.050)	(0.050)	(0.050)	(0.050)
SB-27	3	(0.15)	(0.050)	(0.20)	(0.20)	(0.050)	(0.050)	(0.050)	(0.050)

Notes: mg/kg = milligrams per kilogram
() = Not Detected at concentration

1,2,4-TCB = 1,2,4-Trichlorobenzene
1,2-DCB = 1,2-Dichlorobenzene

1,3-DCB = 1,3-Dichlorobenzene
1,4-DCB = 1,4-Dichlorobenzene

TABLE 3-5 (continued)

**SUMMARY OF SEMI-VOLATILE CONCENTRATIONS IN SOIL SAMPLES
NOVEMBER 1998 DAMES & MOORE ASSESSMENT
4144 GLENCOE AVENUE SITE
LOS ANGELES, CALIFORNIA**

Boring No.	Semi-Volatile Compounds								
	Concentrations (mg/kg)								
	Depth (ft)	Benzo(a) pyrene	Benzo(b) fluoranthene	Benzo(g,h,i) perylene	Benzo(k) fluoranthene	Butyl benzyl phthalate	Carbazole	Chrysene	Di-n-butyl phthalate
SB-3	3	(0.050)	(0.10)	(0.15)	(0.20)	(0.050)	(0.050)	(0.050)	(0.050)
SB-10	3	(0.050)	(0.10)	(0.15)	(0.20)	(0.050)	(0.050)	(0.050)	(0.050)
SB-13	2.5	(0.050)	(0.10)	(0.15)	(0.20)	(0.050)	(0.050)	(0.050)	(0.050)
	3	(0.050)	(0.10)	(0.15)	(0.20)	(0.050)	(0.050)	(0.050)	(0.050)
SB-16	3	(0.050)	(0.10)	(0.15)	(0.20)	(0.050)	(0.050)	(0.050)	(0.050)
SB-18	3	(0.050)	(0.10)	(0.15)	(0.20)	(0.050)	(0.050)	(0.050)	(0.050)
SB-22	2.5	(0.050)	(0.10)	(0.15)	(0.20)	(0.050)	(0.050)	(0.050)	(0.050)
SB-25	3	(0.050)	(0.10)	(0.15)	(0.20)	(0.050)	(0.050)	(0.050)	(0.050)
SB-27	3	(0.050)	(0.10)	(0.15)	(0.20)	(0.050)	(0.050)	(0.050)	(0.050)

Notes: mg/kg = milligrams per kilogram

() = Not Detected at concentration

1,2,4-TCB = 1,2,4-Trichlorobenzene

1,2-DCB = 1,2-Dichlorobenzene

1,3-DCB = 1,3-Dichlorobenzene

1,4-DCB = 1,4-Dichlorobenzene

TABLE 3-5 (continued)

**SUMMARY OF SEMI-VOLATILE CONCENTRATIONS IN SOIL SAMPLES
NOVEMBER 1998 DAMES & MOORE ASSESSMENT
4144 GLENCOE AVENUE SITE
LOS ANGELES, CALIFORNIA**

Boring No.	Semi-Volatile Compounds								
	Concentrations (mg/kg)								
	Depth (ft)	Di-n-octyl phthalate	Dibenz(a,h) anthracene	Dibenzofuran	Diethyl phthalate	Dimethyl phthalate	Fluoroathene	Fluorene	Hexachloro benzene
SB-3	3	(0.10)	(0.10)	(0.050)	(0.050)	(0.050)	(0.050)	(0.050)	(0.050)
SB-10	3	(0.10)	(0.10)	(0.050)	(0.050)	(0.050)	(0.050)	(0.050)	(0.050)
SB-13	2.5	(0.10)	(0.10)	(0.050)	(0.050)	(0.050)	(0.050)	(0.050)	(0.050)
	3	(0.10)	(0.10)	(0.050)	(0.050)	(0.050)	(0.050)	(0.050)	(0.050)
SB-16	3	(0.10)	(0.10)	(0.050)	(0.050)	(0.050)	(0.050)	(0.050)	(0.050)
SB-18	3	(0.10)	(0.10)	(0.050)	(0.050)	(0.050)	(0.050)	(0.050)	(0.050)
SB-22	2.5	(0.10)	(0.10)	(0.050)	(0.050)	(0.050)	(0.050)	(0.050)	(0.050)
SB-25	3	(0.10)	(0.10)	(0.050)	(0.050)	(0.050)	(0.050)	(0.050)	(0.050)
SB-27	3	(0.10)	(0.10)	(0.050)	(0.050)	(0.050)	(0.050)	(0.050)	(0.050)

Notes: mg/kg = milligrams per kilogram

() = Not Detected at concentration

1,2,4-TCB = 1,2,4-Trichlorobenzene

1,2-DCB = 1,2-Dichlorobenzene

1,3-DCB = 1,3-Dichlorobenzene

1,4-DCB = 1,4-Dichlorobenzene

TABLE 3-5 (continued)

**SUMMARY OF SEMI-VOLATILE CONCENTRATIONS IN SOIL SAMPLES
NOVEMBER 1998 DAMES & MOORE ASSESSMENT
4144 GLENCOE AVENUE SITE
LOS ANGELES, CALIFORNIA**

Semi-Volatile Compounds									
Boring No.	Concentrations (mg/kg)								
	Depth (ft)	Hexa chloro butadiene	Hexachloro cyclo pentadiene	Hexachloro ethane	Indeno (1,2,3-c,d) pyrene	Isophorone	N-Nitroso -di-n propylamine	N-Nitrosodi phenylamine	Naphthalene
SB-3	3	(0.10)	(0.10)	(0.050)	(0.050)	(0.050)	(0.050)	(0.050)	(0.050)
SB-10	3	(0.10)	(0.10)	(0.050)	(0.050)	(0.050)	(0.050)	(0.050)	(0.050)
SB-13	2.5	(0.10)	(0.10)	(0.050)	(0.050)	(0.050)	(0.050)	(0.050)	(0.050)
	3	(0.10)	(0.10)	(0.050)	(0.050)	(0.050)	(0.050)	(0.050)	(0.050)
SB-16	3	(0.10)	(0.10)	(0.050)	(0.050)	(0.050)	(0.050)	(0.050)	(0.050)
SB-18	3	(0.10)	(0.10)	(0.050)	(0.050)	(0.050)	(0.050)	(0.050)	(0.050)
SB-22	2.5	(0.10)	(0.10)	(0.050)	(0.050)	(0.050)	(0.050)	(0.050)	(0.050)
SB-25	3	(0.10)	(0.10)	(0.050)	(0.050)	(0.050)	(0.050)	(0.050)	(0.050)
SB-27	3	(0.10)	(0.10)	(0.050)	(0.050)	(0.050)	(0.050)	(0.050)	(0.050)

Notes: mg/kg = milligrams per kilogram
() = Not Detected at concentration

1,2,4-TCB = 1,2,4-Trichlorobenzene
1,2-DCB = 1,2-Dichlorobenzene

1,3-DCB = 1,3-Dichlorobenzene
1,4-DCB = 1,4-Dichlorobenzene

TABLE 3-5 (continued)

**SUMMARY OF SEMI-VOLATILE CONCENTRATIONS IN SOIL SAMPLES
NOVEMBER 1998 DAMES & MOORE ASSESSMENT
4144 GLENCOE AVENUE SITE
LOS ANGELES, CALIFORNIA**

Semi-Volatile Compounds									
Boring No.	Concentrations (mg/kg)								
	Depth (ft)	Nitro benzene	Penta chlorophenol	Phenanthrene	Phenol	Pyrene	bis(2-Chloro ethoxy)-methane	bis(2-Chloro ethyl) ether	bis(2-Ethyl hexyl)-phthalate
SB-3	3	(0.15)	(0.20)	(0.050)	(0.10)	(0.050)	(0.050)	(0.050)	(0.050)
SB-10	3	(0.15)	(0.20)	(0.050)	(0.10)	(0.050)	(0.050)	(0.050)	(0.050)
SB-13	2.5	(0.15)	(0.20)	(0.050)	(0.10)	(0.050)	(0.050)	(0.050)	(0.050)
	3	(0.15)	(0.20)	(0.050)	(0.10)	(0.050)	(0.050)	(0.050)	(0.050)
SB-16	3	(0.15)	(0.20)	(0.050)	(0.10)	(0.050)	(0.050)	(0.050)	(0.050)
SB-18	3	(0.15)	(0.20)	(0.050)	(0.10)	(0.050)	(0.050)	(0.050)	(0.050)
SB-22	2.5	(0.15)	(0.20)	(0.050)	(0.10)	(0.050)	(0.050)	(0.050)	(0.050)
SB-25	3	(0.15)	(0.20)	(0.050)	(0.10)	(0.050)	(0.050)	(0.050)	(0.050)
SB-27	3	(0.15)	(0.20)	(0.050)	(0.10)	(0.050)	(0.050)	(0.050)	(0.050)

Notes: mg/kg = milligrams per kilogram
() = Not Detected at concentration

1,2,4-TCB = 1,2,4-Trichlorobenzene
1,2-DCB = 1,2-Dichlorobenzene

1,3-DCB = 1,3-Dichlorobenzene
1,4-DCB = 1,4-Dichlorobenzene

TABLE 3-6

**SUMMARY OF PCB CONCENTRATIONS IN SOIL SAMPLES
NOVEMBER 1998 DAMES & MOORE ASSESSMENT
4144 GLENCOE AVENUE SITE
LOS ANGELES, CALIFORNIA**

Boring No.	Depth (ft)	Concentration (mg/kg)	
		Aroclor 1254	Aroclor 1260
SB-1	3.0	(0.004)	(0.004)
	7.0	(0.004)	(0.004)
	15.0	(0.004)	(0.004)
SB-2	5.0	(0.004)	(0.004)
	7.0	(0.004)	(0.004)
	15.0	(0.004)	(0.004)
SB-3	3.0	(0.004)	(0.004)
	7.0	(0.004)	(0.004)
	15.0	(0.004)	(0.004)
SB-4	3.0	(0.004)	(0.004)
	7.0	(0.004)	(0.004)
	15.0	(0.004)	(0.004)
SB-5	3.0	(0.004)	(0.004)
	7.0	(0.004)	(0.004)
	15.0	(0.004)	(0.004)
SB-6	3.0	(0.004)	(0.004)
	7.0	(0.004)	(0.004)
	15.0	(0.004)	(0.004)
SB-7	3.0	(0.004)	(0.004)
	7.0	(0.004)	(0.004)
	15.0	(0.004)	(0.004)
SB-8	3.0	0.015	(0.004)
	7.0	0.023	(0.004)
	15.0	(0.004)	(0.004)
SB-9	3.0	0.013	0.013
	7.0	(0.004)	(0.004)
	15.0	(0.004)	(0.004)

() = Not detected at concentration
PCB = Polychlorinated Biphenyl

TABLE 3-6 (continued)

**SUMMARY OF PCB CONCENTRATIONS IN SOIL SAMPLES
NOVEMBER 1998 DAMES & MOORE ASSESSMENT
4144 GLENCOE AVENUE SITE
LOS ANGELES, CALIFORNIA**

Boring No.	Depth (ft)	Concentration (mg/kg)	
		Aroclor 1254	Aroclor 1260
SB-11	3.0	(0.004)	(0.004)
	7.0	0.0099	0.0099
	15.0	(0.004)	(0.004)
SB-12	3.0	0.019	(0.004)
	7.0	(0.004)	(0.004)
	15.0	(0.004)	(0.004)
SB-13	2.5	0.22	(0.004)
	3.0	0.047	(0.004)
	7.0	(0.004)	(0.004)
	14.5	(0.004)	(0.004)
	15	(0.004)	(0.004)
SB-14	3.0	(0.004)	(0.004)
	6.5	(0.004)	(0.004)
	7.0	(0.004)	(0.004)
	15	(0.004)	(0.004)
SB-15	3.0	0.110	(0.004)
	7.0	0.010	(0.004)
	15	(0.004)	(0.004)
SB-16	3.0	0.017	(0.004)
	6.5	(0.004)	(0.004)
	7.0	(0.004)	(0.004)
	15.0	(0.004)	(0.004)
SB-17	2.5	0.017	(0.004)
	3.0	0.140	(0.004)
	7.0	(0.004)	(0.004)
	15.0	0.0091	(0.004)
SB-18	3.0	0.034	(0.004)
	7.0	(0.004)	(0.004)
	15	(0.004)	(0.004)

() = Not detected at concentration

PCB = Polychlorinated Biphenyl

TABLE 3-6 (continued)

**SUMMARY OF PCB CONCENTRATIONS IN SOIL SAMPLES
NOVEMBER 1998 DAMES & MOORE ASSESSMENT
4144 GLENCOE AVENUE SITE
LOS ANGELES, CALIFORNIA**

Boring No.	Depth (ft)	Concentration (mg/kg)	
		Aroclor 1254	Aroclor 1260
SB-19	3.0	(0.004)	(0.004)
	6.5	(0.004)	(0.004)
	7.0	(0.004)	(0.004)
	15.0	(0.004)	(0.004)
SB-20	3.0	(0.004)	(0.004)
	7.0	(0.004)	(0.004)
	15.0	(0.004)	(0.004)
SB-21	3.0	(0.004)	(0.004)
	7.0	(0.004)	(0.004)
	15.0	(0.004)	(0.004)
SB-24	3.0	(0.004)	(0.004)
	7.0	(0.004)	(0.004)
	14.5	(0.004)	(0.004)
	15.0	(0.004)	(0.004)
SB-25	3.0	(0.004)	(0.004)
	7.0	(0.004)	(0.004)
	15.0	(0.004)	(0.004)
SB-26	3.0	(0.004)	(0.004)
	7.0	(0.004)	0.0047
	15.0	(0.004)	(0.004)
SB-27	3.0	.074	(0.004)
	7.0	0.860	(0.020)
	1.5	1.0	(0.020)

() = Not detected at concentration
PCB = Polychlorinated Biphenyl

TABLE 3-7

**SUMMARY OF METAL CONCENTRATIONS IN SOIL SAMPLES
NOVEMBER 1998 DAMES & MOORE ASSESSMENT
1444 GLENCOE AVENUE SITE
LOS ANGELES, CALIFORNIA**

Boring No.	Depth (ft)	Concentrations (mg/kg)									
		Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Molybdenum
Background			7.87			0.37	19.46		24.89	62.04	
SB-3	3	0.72	10.9	95.9	0.65	0.81	39.3	8.7	29.6	4.9	2.1
SB-10	3	0.57	12.2	139	0.70	0.66	41.2	9.0	31.3	5.4	2.0
	7	0.53	8.6	92.1	0.54	0.63	32.8	7.1	25.0	4.1	1.7
	15	0.67	10.9	131	0.70	0.74	35.1	13.6	27.0	6.1	1.7
SB-11	3	0.92	13.0	165	0.73	0.89	43.6	10.6	33.5	5.8	2.4
	7	0.60	10.3	90.7	0.52	0.64	32.0	7.9	25.8	4.4	1.8
	15	0.84	13.8	104	0.82	0.93	39.5	10.9	33.1	7.1	2.1
SB-16	3	0.68	12.3	148	0.69	0.80	39.3	10.4	32.0	5.6	3.0
SB-18	3	0.56	11.6	156	0.70	0.77	42.9	10.1	32.6	5.7	2.7
SB-22	2.5	1.2	14.5	189	0.82	0.97	51.3	11.6	37.5	6.7	4.5
	3	1.0	13.4	161	0.78	0.87	47.3	10.5	35.7	6.0	3.2
	7	0.84	9.2	87.7	0.50	0.66	30.6	7.7	24.5	4.2	2.0
	15	0.54	4.5	115	0.44	0.88	27.3	7.5	17.0	3.9	0.93
SB-23	2.5	0.89	12.4	122	0.74	0.87	44.4	9.5	34.3	5.8	2.4
	3	0.96	13.5	138	0.73	0.99	45.1	11.2	36.2	5.9	2.5
	7	0.90	8.6	86.9	0.46	0.62	28.7	7.0	23.3	4.0	1.7
	15	0.56	9.0	131	0.64	1.1	37.1	10.7	26.6	5.9	1.6
SB-25	3	0.68	12.1	123	0.69	0.92	40.5	10.2	32.6	5.3	2.1
	7	1.0	4.8	52.7	0.25	0.37	19.0	3.9	14.0	2.4	0.76
	15	0.62	5.9	73.6	0.31	0.43	23.9	5.4	16.3	3.4	1.1
SB-26	3	0.69	12.7	124	0.67	0.73	39.2	9.3	30.8	5.1	2.1
	7	5.9	7.3	194	0.39	0.88	35.6	6.7	83.2	241	1.3
	15	0.47	5.2	67.4	0.25	0.39	20.1	3.9	13.4	6.3	0.82
SB-27	3	0.74	11.3	133	0.64	0.79	34.0	8.8	27.7	5.1	2.4

mg/kg - milligrams per kilogram.
() = Not detected at concentration.

Background: Excerpted from *Background Concentrations of Trace and Major Elements in California Soils*, Kearney Foundation of Soil Science, Division of Agriculture and Natural Resources, University of California, 1996

TABLE 3-7 (continued)

**SUMMARY OF SOIL ANALYSIS FOR METALS
NOVEMBER 1998 DAMES & MOORE ASSESSMENT
1444 GLENCOE AVENUE SITE
LOS ANGELES, CALIFORNIA**

Boring No.	Depth (ft)	Concentrations (mg/kg)							
		Nickel	Selenium	Silver	Thallium	Vanadium	Zinc	Chromium, Hexavalent	Mercury
Background		12.60		0.25			89.38		0.17
SB-3	3	30.7	(0.40)	(0.10)	0.71	63.6	63.0	NA	(0.020)
SB-10	3	32.2	(0.40)	(0.10)	0.68	65.1	68.1	(0.30)	(0.020)
	7	27.1	(0.40)	(0.10)	0.57	52.6	53.8	(0.30)	(0.020)
	15	29.5	(0.40)	(0.10)	0.69	60.3	68.2	(0.30)	0.020
SB-11	3	36.2	0.55	(0.10)	0.61	72.0	73.4	(0.30)	(0.020)
	7	27.1	(0.40)	(0.10)	(0.50)	52.8	55.4	(0.30)	(0.020)
	15	34.1	(0.40)	(0.10)	0.82	67.8	76.8	(0.30)	0.031
SB-16	3	33.3	(0.40)	(0.10)	(0.50)	65.4	66.1	NA	(0.020)
SB-18	3	34.1	(0.40)	(0.10)	0.75	64.7	66.4	NA	(0.020)
SB-22	2.5	39.0	(0.40)	(0.10)	(0.50)	90.0	79.8	(0.30)	(0.020)
	3	36.7	(0.40)	0.11	0.66	80.4	74.8	(0.30)	0.022
	7	25.9	(0.40)	(0.10)	0.57	52.9	54.7	(0.30)	(0.020)
	15	20.7	(0.40)	(0.10)	1.00	43.3	55.5	(0.30)	(0.020)
SB-23	2.5	34.3	(0.40)	0.14	(0.50)	74.8	71.9	(0.30)	0.020
	3	37.8	(0.40)	0.12	0.73	75.3	77.3	NA	0.027
	7	24.2	(0.40)	(0.10)	(0.50)	48.5	50.6	(0.30)	(0.020)
	15	29.1	(0.40)	(0.10)	0.72	60.3	71.1	(0.30)	0.020
SB-25	3	35.1	(0.40)	(0.10)	0.58	66.0	69.8	(0.30)	(0.020)
	7	15.3	(0.40)	(0.10)	0.69	30.6	33.2	(0.30)	(0.020)
	15	18.4	(0.40)	(0.10)	(0.50)	38.6	48.3	(0.30)	(0.020)
SB-26	3	32.8	(0.40)	(0.10)	(0.50)	62.1	65.2	(0.30)	(0.020)
	7	26.3	(0.40)	(0.10)	(0.50)	49.7	20.8	(0.30)	0.021
	15	14.5	(0.40)	(0.10)	0.61	29.8	45.9	(0.30)	0.021
SB-27	3	32.6	(0.40)	(0.10)	(0.50)	58.3	59.0	NA	0.029

mg/kg - milligrams per kilogram.
() = Not detected at concentration.

Background: Excerpted from *Background Concentrations of Trace and Major Elements in California Soils*, Kearney Foundation of Soil Science, Division of Agriculture and Natural Resources, University of California, 1996

TABLE 3-8

**SUMMARY OF PCB CONCENTRATIONS IN SOIL SAMPLES
MAY 1999 DAMES & MOORE ASSESSMENT
4144 GLENCOE AVENUE SITE
LOS ANGELES, CALIFORNIA**

Boring No.	Depth (ft)	Concentrations (mg/kg)	
		Arochlor 1254	Arochlor 1260
SB-30	16	(0.1)	(0.1)
	20	(0.1)	(0.1)
SB-31	6	(0.1)	(0.1)
SB-57	3	(0.1)	(0.1)
SV-58	5	(0.1)	(0.1)
SV-59	5	(0.1)	(0.1)

Notes: () = Analyte concentration less than Method Reporting Limit.
mg/kg = milligrams per kilogram

TABLE 3-9

**SUMMARY OF HEXAVALENT CHROMIUM CONCENTRATIONS IN SOIL SAMPLES
MAY 1999 DAMES & MOORE ASSESSMENT
4144 GLENCOE AVENUE SITE
LOS ANGELES, CALIFORNIA**

Boring No.	Depth (ft)	Concentrations (mg/kg)
SB-31	6	(4)
SB-57	3	(8)
SV-58	5	(4)
SV-59	5	(4)

Notes: () = Analyte concentration less than Method Reporting Limit.
mg/kg = milligrams per kilogram

TABLE 3-10

**SUMMARY OF VOC CONCENTRATIONS IN SOIL VAPOR SAMPLES
1997 TERRANEXT ASSESSMENT
4144 GLENCOE AVENUE SITE
LOS ANGELES, CALIFORNIA**

Boring No.	Concentrations (µg/L)								
	Detector	ECD2	ECD2	ECD1	ECD1	ECD1	ECD1	ECD1	ECD1
	Run time (min.)	2.06	3.65	1.742	2.275	2.692	3.275	3.442	3.575
	Depth (ft)	dichloro fluoromethane	trichloro trifluoroethene	trichloro fluoromethane	methylene chloride	1,1-DCA	chloroform	1,1,1-TCA	carbon tetrachloride
Blank		(0.1)	(0.1)	(0.01)	(1)	(1)	(0.01)	(0.01)	(0.01)
Ambient		(0.1)	(0.1)	(0.01)	(1)	(1)	(0.01)	(0.01)	(0.01)
SG-1A	5	(1)	(1)	(0.1)	7.7	(10)	6.3	1.4	(0.1)
SG-1B	5	(1)	(1)	(0.1)	13	(10)	15	3.5	(0.1)
SG-1C	5	(1)	(1)	(0.1)	(10)	(10)	1.7	0.37	(0.1)
SG-1	10	(1)	(1)	(0.1)	6.7	(10)	7.7	1.8	(0.1)
SG-2	5	(10)	(10)	(1)	(100)	(100)	4.7	(1)	(1)
	10	(10)	(10)	(1)	(100)	(100)	5.7	(1)	(1)
	18	(10)	(10)	(1)	(100)	(100)	5.2	1.1	(1)
	18 (a)	(10)	(10)	(1)	(100)	(100)	4.1	1.1	(1)
SG-3	5	(10)	(10)	(1)	(100)	(100)	3.4	(1)	(1)
SG-4	5	(1)	(1)	(0.1)	(10)	(10)	0.80	(0.1)	(0.1)
SG-5	5	(1)	(1)	(0.1)	(10)	(10)	2.2	0.20	(0.1)
SG-6	5	(1)	(1)	(0.1)	(10)	(10)	2.6	0.12	(0.1)
SG-7	5	(0.1)	(0.1)	(0.01)	(1)	(1)	0.042	(0.01)	(0.01)

Data from TerraNext – Draft Interim Remedial Workplan, May 12, 1997

(a) = Duplicate Sample

NA = Sample not analyzed for associated VOC

() = Not detected at concentration

MI = Matrix interference
µg/l = Micrograms per liter

1,1-DCA = 1,1-Dichloroethane
1,1,1-TCA = 1,1,1-Trichloroethane

TABLE 3-10 (continued)

**SUMMARY OF VOC CONCENTRATIONS IN SOIL VAPOR SAMPLES
1997 TERRANEXT ASSESSMENT
4144 GLENCOE AVENUE SITE
LOS ANGELES, CALIFORNIA**

Boring No.	Concentration (µg/L)									
	Detector	ECD1	ECD1	ECD1	ECD1	ECD1	ECD1	PID	PID	PID
	Run time (min.)	3.717	4.233	5.792	5.975	6.992	9.34	1.417	1.79	2.33
	Depth (ft)	1,2-DCA	TCE	1,1,2-TCA	PCE	1,1,1,2-TCA	1,1,2,2-TCA	Vinyl chloride	chloroethane	1,1-DCA
Blank		(1)	(0.01)	(1)	(0.01)	(1)	(1)	(1)	(1)	(1)
Ambient		(1)	(0.01)	(1)	(0.01)	(1)	(1)	(1)	(1)	(1)
SG-1A	5	(10)	NA	(10)	NA	(10)	(10)	(1)	(1)	(1)
SG-1B	5	(10)	NA	(10)	NA	(10)	(10)	(1)	(1)	(1)
SG-1C	5	(10)	NA	(10)	NA	(10)	(10)	(1)	(1)	(1)
SG-1	10	(10)	NA	(10)	NA	(10)	(10)	(1)	(1)	1.1
SG-2	5	(100)	NA	(100)	NA	(100)	(100)	(1)	(1)	(1)
	10	(100)	NA	(100)	NA	(100)	(100)	(1)	(1)	(1)
	18	(100)	600	(100)	270	(100)	(100)	2.0	(1)	(1)
	18 (a)	(100)	540	(100)	260	(100)	(100)	1.9	(1)	(1)
SG-3	5	(100)	900	(100)	360	(100)	(100)	(1)	(1)	(1)
SG-4	5	(10)	NA	(10)	NA	(10)	(10)	(1)	(1)	(1)
SG-5	5	(10)	NA	(10)	NA	(10)	(10)	(1)	(1)	(1)
SG-6	5	(10)	NA	(10)	NA	(10)	(10)	(1)	(1)	(1)
SG-7	5	(1)	8.4	(1)	NA	(1)	(1)	(1)	(1)	(1)

Data from TerraNext – Draft Interim Remedial Workplan, May 12, 1997

(a) = Duplicate Sample

NA = Sample not analyzed for associated VOC

() = Not detected at concentration

MI = Matrix interference

µg/l = Micrograms per liter

1,2-DCA = 1,2-Dichloroethane

TCE = Trichloroethylene

1,1,2-TCA = 1,1,2-Trichloroethane

PCE = Tetrachloroethylene

1,1,1,2-TCA = 1,1,1,2-Trichloroethane

1,1,2,2-TCA = 1,1,2,2-Trichloroethane

1,1-DCA = 1,1-Dichloroethane

TABLE 3-10 (continued)

SUMMARY OF VOC CONCENTRATIONS IN SOIL VAPOR SAMPLES
1997 TERRANEXT ASSESSMENT
4144 GLENCOE AVENUE SITE
LOS ANGELES, CALIFORNIA

Boring No.	Concentration (µg/L)									
	Detector	PID	PID	PID	PID	PID	PID	PID	PID	PID
	Run time (min.)	2.767	3.217	4.1	4.633	5.75	6.517	7.267	7.4	7.783
	Depth (ft)	Trans-1,2-DCE	cis-1,2-DCE	benzene	TCE	toluene	PCE	ethylbenzene	m/p-xylenes	o-xylene
Blank		(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Ambient		(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
SG-1A	5	(1)	43	(1)	400	8.3	440	(1)	(1)	(1)
SG-1B	5	(1)	64	(10)	450	3.5	680	(1)	(1)	(1)
SG-1C	5	(1)	75	(1)	340	2.2	630	(1)	(1)	(1)
SG-1	10	(1)	74	(1)	620	(1)	800	(1)	(1)	(1)
SG-2	5	5.4	180	(1)	730	(1)	940	(1)	(1)	(1)
	10	5.8	240	(1)	880	(1)	830	(1)	(1)	(1)
	18	1.8	120	(1)	NA	(1)	NA	(1)	(1)	(1)
	18 (a)	1.7	110	(1)	NA	(1)	NA	(1)	(1)	(1)
SG-3	5	(1)	40	(1)	NA	(1)	NA	(1)	(1)	(1)
SG-4	5	(1)	5.7	(1)	98	(1)	96	(1)	(1)	(1)
SG-5	5	(1)	14	(1)	330	(1)	320	(1)	(1)	(1)
SG-6	5	(1)	8.9	(1)	350	2.7	430	(1)	(1)	(1)
SG-7	5	(1)	(1)	(1)	NA	(1)	12	(1)	(1)	(1)

Data from TerraNext – Draft Interim Remedial Workplan, May 12, 1997

(a) = Duplicate Sample

NA = Sample not analyzed for associated VOC

() = Not detected at concentration

MI = Matrix interference
µg/l = Micrograms per liter

trans-1,2-DCE = trans-1,2-Dichloroethene
cis-1,2-DCE = cis-1,2-Dichloroethene

PCE = Tetrachloroethylene
TCE = Trichloroethylene

TABLE 3-10 (continued)

**SUMMARY OF VOC CONCENTRATIONS IN SOIL VAPOR SAMPLES
1997 TERRANEXT ASSESSMENT
4144 GLENCOE AVENUE SITE
LOS ANGELES, CALIFORNIA**

Boring No.	Concentration (µg/L)			
	Detector	PID	ECD	ECD
	Run time (min.)	4.217	4.542	6.25
	Depth (ft)	% Surrogate 1 Recovery	% Surrogate 2 Recovery	% Surrogate 3 Recovery
Blank		NA	NA	NA
Ambient		112	121	117
SG-1A	5	108	113	MI
SG-1B	5	94	MI	MI
SG-1C	5	117	MI	MI
SG-1	10	96	MI	MI
SG-2	5	83	102	MI
	10	110	96	MI
	18	110	MI	MI
	18 (a)	100	MI	MI
SG-3	5	121	81	93
SG-4	5	81	71	MI
SG-5	5	96	104	MI
SG-6	5	108	82	MI
SG-7	5	86	99	91

Data from TerraNext – Draft Interim Remedial Workplan, May 12, 1997

(a) = Duplicate Sample

NA = Sample not analyzed for associated VOC

() = Not detected at concentration

MI = Matrix interference

µg/l = Micrograms per liter

TABLE 3-11

**SUMMARY OF VOC CONCENTRATIONS IN SOIL VAPOR SAMPLES
NOVEMBER 1998 DAMES & MOORE ASSESSMENT
4144 GLENCOE AVENUE SITE
LOS ANGELES, CALIFORNIA**

Boring No.	Depth (ft)	Dilution Factor	Concentrations (µg/l)					
			Chloroform	cis-1,2-DCE	PCE	TCE	% Surrogate Recovery 1,4-difluorobenzene	% Surrogate Recovery chlorobenzene
Blank 11/3/98		1	(0.5)	(0.5)	(0.5)	(0.5)	82	99
Blank 11/4/98		1	(0.5)	(0.5)	(0.5)	(0.5)	82	98
Blank 11/5/98		1	(0.5)	(0.5)	(0.5)	(0.5)	81	98
SV1	5	1	(0.5)	(0.5)	(0.5)	(0.5)	87	104
SV2	5	1	(0.5)	(0.5)	(0.5)	(0.5)	83	99
SV3	5	1	(0.5)	(0.5)	(0.5)	(0.5)	89	107
SV4	5	1	(0.5)	(0.5)	(0.5)	(0.5)	87	105
SV5	5	1	(0.5)	(0.5)	(0.5)	(0.5)	84	100
SV6	5	1	(0.5)	(0.5)	(0.5)	(0.5)	85	100
SV7	5	1	(0.5)	(0.5)	(0.5)	(0.5)	84	100
SV8	5	1	(0.5)	(0.5)	1.3	(0.5)	81	96
SV9	5	1	(0.5)	(0.5)	11	2.5	83	99

PCE = Tetrachloroethylene

TCE = Trichloroethylene

cis-1,2-DCE = cis-1,2-Dichloroethylene

µg/L = micrograms per liter.

() = Not detected at concentration.

** Indicates that the analyte was quantified from the FID.

TABLE 3-11 (continued)

**SUMMARY OF VOC CONCENTRATIONS IN SOIL VAPOR SAMPLES
NOVEMBER 1998 DAMES & MOORE ASSESSMENT
4144 GLENCOE AVENUE SITE
LOS ANGELES, CALIFORNIA**

Boring No.	Depth (ft)	Dilution Factor	Concentrations (µg/l)					
			Chloroform	cis-1,2-DCE	PCE	TCE	% Surrogate Recovery 1,4-difluorobenzene	% Surrogate Recovery chlorobenzene
SV10	5	1	(0.5)	(0.5)	2.7	2.4	85	102
SV11	5	1	(0.5)	(0.5)	14	13	86	102
SV12	5	1	(0.5)	(0.5)	2.2	(0.5)	83	98
SV13	5	1	(0.5)	(0.5)	32.7	36.7	85	101
SV14	5	1	(0.5)	(0.5)	3.8	1.0	83	99
SV15	5	1	(0.5)	(0.5)	1.6	1.0	83	101
SV16	5	1	(0.5)	(0.5)	47.4	21.8	78	96
SV17	5	1	(0.5)	(0.5)	54.1	46.3	80	94
SV18	5	1	1.3	5.6	139.7**	130.3**	81	95
	14	1	(0.5)	(0.5)	6.7	6.6	82	97
SV19	5	1	2.2	9.1	150.4**	169.8**	79	95
	14	1	(0.5)	(0.5)	17.5	10.0	81	96
SV20	5	1	2.9	13.6	138.7**	190.3**	79	94
	14	1	(0.5)	(0.5)	47.3	34.5	80	95

PCE = Tetrachloroethylene

TCE = Trichloroethylene

cis-1,2-DCE = cis-1,2-Dichloroethylene

µg/L = micrograms per liter.

() = Not detected at concentration.

** Indicates that the analyte was quantified from the FID.

TABLE 3-11 (continued)

**SUMMARY OF VOC CONCENTRATIONS IN SOIL VAPOR SAMPLES
NOVEMBER 1998 DAMES & MOORE ASSESSMENT
4144 GLENCOE AVENUE SITE
LOS ANGELES, CALIFORNIA**

Boring No.	Depth (ft)	Dilution Factor	Concentrations (µg/l)					
			Chloroform	cis-1,2-DCE	PCE	TCE	% Surrogate Recovery 1,4-difluorobenzene	% Surrogate Recovery chlorobenzene
SV21	5	1	(0.5)	(0.5)	7.58	13.2	82	97
SV22	5	1	2.8	9.7	120.6**	136.8**	84	98
SV23	5	1	(0.5)	0.6	15	16	84	100
SV24	5	1	(0.5)	1.3	12	13	82	98
SV25	5	1	(0.5)	6.8	26.6	31.5	82	97
SV26	5	1	(0.5)	9.4	42.5	55.4	82	98
SV27	5	1	(0.5)	(0.5)	3.9	3.1	82	98
SV28	5	1	(0.5)	(0.5)	1.8	1.3	84	100
SV29	5	1	(0.5)	12.5	62.7	74.9	81	96
SV30	5	1	(0.5)	(0.5)	1.5	1.1	85	104
SV31	5	1	0.6	13.8	90.9**	88.8**	83	98
SV32	5	1	(0.5)	(0.5)	3.4	2.3	84	101
SV33	5	1	(0.5)	12.6	26.3	42.2	81	95
SV34	5	1	(0.5)	0.8	6.8	10.0	79	95

PCE = Tetrachloroethylene

TCE = Trichloroethylene

cis-1,2-DCE = cis-1,2-Dichloroethylene

µg/L = micrograms per liter.

() = Not detected at concentration.

** Indicates that the analyte was quantified from the FID.

TABLE 3-11 (continued)

**SUMMARY OF VOC CONCENTRATIONS IN SOIL VAPOR SAMPLES
NOVEMBER 1998 DAMES & MOORE ASSESSMENT
4144 GLENCOE AVENUE SITE
LOS ANGELES, CALIFORNIA**

Boring No.	Depth (ft)	Dilution Factor	Concentrations (µg/l)					
			Chloroform	cis-1,2-DCE	PCE	TCE	% Surrogate Recovery 1,4-difluorobenzene	% Surrogate Recovery chlorobenzene
SV35	5	1	(0.5)	(0.5)	(0.5)	(0.5)	83	98
SV36	5	1	(0.5)	(0.5)	1.2	0.6	83	99
SV37	5	1	(0.5)	(0.5)	7.1	6.6	85	101
SV38	5	1	(0.5)	(0.5)	6.0	6.1	84	96
SV39	5	1	(0.5)	5.7	193.5**	183.5**	75	89
	14	1	(0.5)	(0.5)	6.7	4.7	83	99
SV40	5	1	(0.5)	(0.5)	(0.5)	(0.5)	83	93
SV41	5	1	(0.5)	(0.5)	(0.5)	(0.5)	82	99
SV42	5	1	(0.5)	(0.5)	(0.5)	(0.5)	83	100
SV43	5	1	(0.5)	(0.5)	1.3	(0.5)	83	101
SV44	5	1	(0.5)	(0.5)	3.9	1.0	80	97
SV45	5	1	(0.5)	(0.5)	1.1	(0.5)	79	96
SV46	5	1	(0.5)	(0.5)	1.6	0.7	82	99
SV47	5	1	(0.5)	(0.5)	26.7	9.4	81	96

PCE = Tetrachloroethylene

TCE = Trichloroethylene

cis-1,2-DCE = cis-1,2-Dichloroethylene

µg/L = micrograms per liter.

() = Not detected at concentration.

** Indicates that the analyte was quantified from the FID.

TABLE 3-11 (continued)

**SUMMARY OF VOC CONCENTRATIONS IN SOIL VAPOR SAMPLES
NOVEMBER 1998 DAMES & MOORE ASSESSMENT
4144 GLENCOE AVENUE SITE
LOS ANGELES, CALIFORNIA**

Boring No.	Depth (ft)	Dilution Factor	Concentrations (µg/l)					
			Chloroform	cis-1,2-DCE	PCE	TCE	% Surrogate Recovery 1,4-difluorobenzene	% Surrogate Recovery chlorobenzene
SV48	5	1	(0.5)	(0.5)	2.8	0.9	82	97
SV49	5	1	(0.5)	(0.5)	14.4	13.9	84	100
SV50	5	1	(0.5)	1.9	167.8**	138.3**	80	93
SV51	5	1	(0.5)	(0.5)	5.4	4.9	83	99
SV52	5	1	(0.5)	0.8	36.9	31.9	80	95
SV53	5	1	1.2	9.7	244.7**	189.4**	79	93
SV54	5	1	(0.5)	1.1	17.2	15.9	82	97
SV55	14	1	(0.5)	(0.5)	4.4	4.2	83	98
SV56	14	1	(0.5)	(0.5)	1.2	1.0	82	98

PCE = Tetrachloroethylene

TCE = Trichloroethylene

cis-1,2-DCE = cis-1,2-Dichloroethylene

µg/L = micrograms per liter.

() = Not detected at concentration.

** Indicates that the analyte was quantified from the FID.

TABLE 3-12

**SUMMARY OF VOC CONCENTRATIONS IN SOIL VAPOR SAMPLES
MAY 1999 DAMES & MOORE ASSESSMENT
4144 GLENCOE AVENUE SITE
LOS ANGELES, CALIFORNIA**

Sample Location	Concentration (µg/L)		
	PCE	TCE	cis-1,2-DCE
SV-57	1,300	600	8.9
SV-58	190	88	(0.5)
SV-59	370	180	(1)

PCE = Tetrachloroethylene

TCE = Trichloroethylene

cis-1,2-DCE = cis-1,2-Dichloroethylene

Note:

µg/L = micrograms per liter.

() = Analyte concentration less than Method Reporting Limit.

TABLE 3-13
SUMMARY OF VOC CONCENTRATIONS IN SOIL VAPOR SAMPLES
AUGUST 1999 DAMES & MOORE ASSESSMENT
4144 GLENCOE AVENUE SITE
LOS ANGELES, CALIFORNIA

Boring No.	Concentrations (µg/L)										
	Depth (ft)	benzene	toluene	ethyl benzene	xylenes	chloroform	PCE	TCE	MtBE	1,1,1-TCA	methyl chloride
SV57B	15.5	ND	ND	ND	ND	ND	1200	380	ND	ND	ND
SV58B	5	ND	0.120	0.089	0.360	ND	7.2	2	0.048	ND	ND
	5	ND	0.110	0.088	0.350	ND	6.8	1.9	0.048	ND	ND
SV60	5	0.017	0.071	0.023	0.172	0.002	0.082	0.002	0.037	ND	0.006
	15	0.009	0.120	0.047	0.420	ND	0.7	0.061	0.043	0.002	0.001
SV61	5	0.020	0.110	0.040	0.304	ND	0.37	0.04	0.06	ND	0.005
SV63	5	ND	ND	ND	ND	ND	270	100	ND	ND	ND
	15	0.051	0.240	0.052	0.390	ND	21	7.8	0.14	ND	ND
	15	0.045	0.210	0.048	0.349	ND	18	6.9	0.13	ND	ND
SV64	5	ND	ND	ND	ND	ND	1100	360	ND	ND	ND
	16	ND	ND	ND	ND	ND	510	160	ND	ND	ND
SV65	5	0.030	0.140	0.031	0.214	ND	0.079	0.014	0.086	ND	0.01
	15	0.062	0.420	0.098	0.680	ND	0	0.066	0.22	ND	0.016
SV67	5.5	ND	ND	ND	ND	ND	310	120	ND	ND	ND
SV68	5.5	ND	ND	ND	ND	ND	210	63	ND	ND	ND
	16	ND	ND	ND	ND	ND	67	21	ND	ND	ND

Note: 1,1,1-TCA = 1,1,1-Trichloroethane

MtBE = Methyl Turtbutyl Ether

ND = Analyte not detected in that sample.

µg/L = micrograms per liter.

TABLE 3-13 (continued)
SUMMARY OF VOC CONCENTRATIONS IN SOIL VAPOR SAMPLES
AUGUST 1999 DAMES & MOORE ASSESSMENT
4144 GLENCOE AVENUE SITE
LOS ANGELES, CALIFORNIA

Boring No.	Concentration (µg/L)								
	Depth (ft)	acetone	4-methyl-2-pentanone	styrene	2-butanone	chloromethane	trichloro-fluoromethane	carbon disulfide	1,4-DCB
SV57B	15.5	ND	ND	ND	ND	ND	ND	ND	ND
SV58B	5	0.061	ND	ND	ND	ND	ND	0.069	ND
	5	0.061	ND	ND	ND	ND	ND	0.068	ND
SV60	5	0.100	0.005	0.004	0.017	0.002	0.002	0.007	ND
	15	0.025	0.003	ND	0.004	ND	0.002	0.006	0.001
SV61	5	0.043	ND	0.004	0.006	ND	ND	0.008	ND
SV63	5	ND	ND	ND	ND	ND	ND	ND	ND
	15	0.068	ND	ND	ND	ND	ND	ND	ND
	15	0.062	ND	ND	ND	ND	ND	ND	ND
SV64	5	ND	ND	ND	ND	ND	ND	ND	ND
	16	ND	ND	ND	ND	ND	ND	ND	ND
SV65	5	0.066	0.004	0.005	0.006	0.002	0.002	ND	ND
	15	0.084	0.007	0.008	0.018	ND	ND	ND	ND
SV67	5.5	ND	ND	ND	ND	ND	ND	ND	ND
SV68	5.5	ND	ND	ND	ND	ND	ND	ND	ND
	16	ND	ND	ND	ND	ND	ND	ND	ND

Note: 1,4-DCB = 1,4-Dichlorobenzene

ND = Analyte not detected in that sample.

µg/L = micrograms per liter.

TABLE 3-14

**SOIL GAS SAMPLE CONCENTRATIONS
4144 GLENCOE AVENUE
LOS ANGELES, CALIFORNIA**

Sample	Date	Concentration	Toluene	Total Xylenes	Chloroform	c-1,2-Dichloroethene	trans-1,2-Dichloroethene	Tetrachloroethene	Trichloroethene
CSV-1-5	5/14/05	ug/kg	< 1.0	< 1.0	1.6	1.6	< 1.0	230	320
CSV-1A-5	5/14/05	ug/kg	< 1.0	2.3	1.2	1.2	< 1.0	31	61
CSV-1B-5	5/14/05	ug/kg	< 1.0	1.7	1.6	1.6	< 1.0	200	150
CSV-2-5	5/14/05	ug/kg	< 1.0	1.3	< 1.0	2.0	< 1.0	24	20
CSV-3-5	5/14/05	ug/kg	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	41	86
CSV-4-5	5/14/05	ug/kg	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	89	130
CSV-5-5	5/14/05	ug/kg	1.2	< 1.0	< 1.0	4.0	< 1.0	19	74
CSV-6-5	5/14/05	ug/kg	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	13	16
CSV-7-5	5/14/05	ug/kg	< 1.0	< 1.0	1.2	< 1.0	< 1.0	100	99
CSV-8-5	5/14/05	ug/kg	1.1	< 1.0	< 1.0	< 1.0	< 1.0	19	24
CSV-9-5	5/14/05	ug/kg	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	22	56
CSV-10-5	5/14/05	ug/kg	< 1.0	< 1.0	< 1.0	8.8	< 1.0	46	120
CSV-11-5	5/15/05	ug/kg	1.3	< 1.0	1.2	16	< 1.0	15	82
CSV-12-5	5/15/05	ug/kg	1.3	< 1.0	2.2	52	< 1.0	47	160
CSV-13-5	5/15/05	ug/kg	1.8	< 1.0	1.8	24	< 1.0	29	100
CSV-14A-5	5/15/05	ug/kg	1.5	< 1.0	1.7	16	< 1.0	48	210
CSV-14B-5	5/15/05	ug/kg	1.0	< 1.0	1.5	27	< 1.0	940	600
CSV-15-5	5/15/05	ug/kg	1.3	1.5	1.0	3.3	< 1.0	250	160
CSV-16-5	5/15/05	ug/kg	< 1.0	< 1.0	11	200	1.9	2000	890
CSV-17A-5	5/15/05	ug/kg	1.2	< 1.0	22	520	3.3	1100	1200
CSV-17B-5	5/15/05	ug/kg	1.1	< 1.0	27	580	3.6	1900	1400
CSV-18-5	5/15/05	ug/kg	< 1.0	5.4	3.9	120	< 1.0	970	680
CSV-19-5	5/15/05	ug/kg	< 1.0	1.2	3.3	66	< 1.0	930	540
CSV-20-5	5/15/05	ug/kg	< 1.0	5.7	3.6	52	< 1.0	1200	640
CSV-21-5	5/15/05	ug/kg	< 1.0	1.1	14	290	1.5	1400	950
CSV-22-5	5/15/05	ug/kg	< 1.0	< 1.0	2.4	28	< 1.0	930	480
CSV-23-5	5/15/05	ug/kg	< 1.0	< 1.0	5.3	46	< 1.0	920	590

TABLE 3-15

**SOIL SAMPLE CONCENTRATIONS
4144 GLENCOE AVENUE SITE
LOS ANGELES, CALIFORNIA**

Sample	Date	Concentration	Chloroform	c-1,2-Dichloroethene	Tetrachloroethene	Trichloroethene
CSV-1@13	05/14/05	ug/kg	1.9	1.9	160	100
CSV-2@13	05/15/05	ug/kg	2	4.8	380	140
CSV-3@14	05/15/05	ug/kg	2.1	9.5	480	250
CSV-4@13	05/15/05	ug/kg	1.8	3.6	840	110

TABLE 3-16
SUMMARY OF CPT SOUNDINGS
4144 GLENCOE AVENUE SITE
LOS ANGELES, CALIFORNIA

BORING	SURFACE ELEVATION	TOTAL DEPTH	GROUNDWATER SAMPLE DEPTHS	TARGET DEPTH
CPT-1	22.94	60.0	34-39	60
CPT-2	23.33	60.2	35.5-38.5, 48.5-53.5	60
CPT-3	22.61	43.8	34-39	60
CPT-4A	23.74	60.0	27.5-32.5, 38.5-43.5	60
CPT-5A	23.07	60.0	49-54	60
CPT-6	23.07	50.4	20-25, 26-31	60
CPT-7B	21.64	26.1	25-30	30
CPT-8	21.27	60.0	22-27, 32-37, 42-47	60
CPT-9	23.93	60.0	30-35, 45-53	60
CPT-10	22.57	49.9		60
CPT-10D			47.5-52.5	52
CPT-10S			30-35	35
CPT-11	21.52	30.0	24-29	30
CPT-12	22.62	32.2	26-31	30
CPT-13A		28.1	23-28	30
CPT-13B		60.0	31.5-36.5	60
CPT-15	20.96	60.0	22-27, 31-36, 41-46	60
CPT-16	23.41	60.4	23-28, 37-42, 48-53	60
CPT-17	22.80	60.0	25.5-30.5, 34.5-39.5, 47-52.5	60
CPT-18	22.04	60.0	28-33, 36-41, 36-41	60
CPT-19	23.74	74.2	35-40*, 46-51, 63-68	60
CPT-20	21.95	60.0	22.5-27.5, 35-40, 42.5-45.5	60
CPT-21	20.50	60.0	23-27, 28-31, 44-48	60
CPT-22	20.00	60.0	29-33, 37-41, 44-48	60
CPT-23	19.41	70.0	35-40, 44.5-48.5, 59-64	60
CPT-24	18.73	70.1	33-37, 39-42, 49-53, 61-65	60
CPT-25	20.66	60.0	29-33, 37-41, 43-47	60
CPT-26	18.22	68.1	35-40, 48-52, 63.5-67.5	60
CPT-27	NM	45.6	28-33, 49-53	60
CPT-28	NM	49.1	25-30, 38-43, 47-50	60
CPT-A	NM	60.0	40-43, 49-54	60
CPT-B	NM	60.0	27-32, 40-44, 47.5-52.5	60
CPT-C	NM	60.0	25-30, 34-38, 47-52	60
CPT-D	NM	60.0	25.5-30.5, 33.6-37.6, 41-46, 48-53	60

NM = Elevation not measured.

Only the deepest boring, per boring location is noted in this table.

TABLE 4-1

**SUMMARY OF COPCs IN SOIL
4144 GLENCOE AVENUE SITE
LOS ANGELES, CALIFORNIA**

Metals		
Antimony Arsenic Barium Beryllium Cadmium Chromium	Chromium hexavalent Cobalt Copper Lead Mercury Molybdenum	Nickel Selenium Silver Thallium Vanadium Zinc
PCBs		
Arochlor 1248	Arochlor 1254	Arochlor 1260
VOCs		
1,3-Dichlorobenzene 1,4-Dichlorobenzene cis-1,2-Dichloroethene	Methylene chloride Tetrachloroethene Toluene	1,2,3-Trichlorobenzene 1,2,4-Trichlorobenzene Trichloroethene

TABLE 4-2

**SUMMARY OF COPCs IN SOIL VAPOR
4144 GLENCOE AVENUE SITE
LOS ANGELES, CALIFORNIA**

VOCs		
Acetone	cis-1,2-Dichloroethene	Toluene
Benzene	Ethylbenzene	1,1,1-Trichloroethane
2-Butanone (MEK)	4-Methyl-2-pentanone	Trichloroethene
Carbon disulfide	Methylene chloride	Trichlorofluoromethane
Chloroform	Methyl tert-butyl ether	p/m-Xylene
Chloromethane	(MtBE)	o-Xylene
1,4-Dichlorobenzene	Styrene	
	Tetrachloroethene	

TABLE 4-3

**SUMMARY OF COPCs IN GROUNDWATER
4144 GLENCOE AVENUE SITE
LOS ANGELES, CALIFORNIA**

VOCs		
Benzene	cis-1,2-Dichloroethene	1,2,3-Trichlorobenzene
Carbon tetrachloride	trans-1,2-Dichloroethene	1,2,4-Trichlorobenzene
Chloroform	Ethylbenzene	1,1,1-Trichloroethane
1,2-Dichlorobenzene	1,1,1,2-Tetrachloroethane	1,1,2-Trichloroethane
1,3-Dichlorobenzene	1,1,2,2-Tetrachloroethane	Trichloroethene
1,4-Dichlorobenzene	Tetrachloroethane	p/m-Xylene
1,1-Dichloroethene	Toluene	o-Xylene

TABLE 4-4

**CLEANUP CRITERIA
4144 GLENCOE AVENUE SITE
LOS ANGELES, CALIFORNIA**

Medium	Cleanup Criteria	
	Chlorinated VOCs (PCE and TCE)	PCBs
Soil	Source zone cleanup criteria (below) govern the soil cleanup.	Remove concentrations exceeding 17 mg/kg to a maximum depth of ten feet bgs (see Exhibit 1).
Source Zone	<p>Apply in-situ technology in VOC source zone to destroy contaminants to the limit of the technology.</p> <p>Provide adequate engineered controls to mitigate exposure to chlorinated VOC soil vapor concentrations to risk levels of $<10^{-6}$ for future on-site residents, and $<10^{-5}$ for future landscapers and utility workers. In addition, mitigate risk so that the noncancer hazard index is <1 (see Exhibit 2).</p>	Remove soil column containing high-concentration PCBs within footprint of VOC source zone.
Groundwater	<p>Manage the dissolved plume to demonstrate acceptable future risk to off-site receptors: risk levels of $<10^{-6}$ for future off-site residents, $<10^{-5}$ for future landscapers and utility workers; noncancer hazard index of <1; continue meeting ecological risk standards downgradient of the Site.</p> <p>Protect deep aquifer.</p>	Not a groundwater COC.

TABLE 5-1
IDENTIFICATION AND SCREENING OF TECHNOLOGIES
4144 GLENCOE AVENUE SITE
LOS ANGELES, CALIFORNIA

TECHNOLOGY TYPE	TECHNOLOGY	DESCRIPTION	SCREENING CRITERIA			COMMENTS
			EFFECTIVENESS	IMPLEMENTABILITY	COST	
No action	No action		Not effective. Does not mitigate potential exposure to impacted materials.	Not acceptable unless combined with other institutional actions.	Minimal cost.	Retained as required by the RI/FS guidance.
Institutional Controls	Deed restriction	Prohibit sensitive land uses and prohibit groundwater extraction for drinking water purposes.	Effective. Exposure mitigation depends on level of restriction.	Implementable with owner cooperation and agency approval. Must meet legal requirements. May be implemented in combination with other technologies.	Minimal cost.	Retained.
Biological	Enhanced in-situ bioremediation	Distribute chlorinated compound respiring bacteria culture and/or electron donor throughout vadose zone to stimulate biological degradation of contaminants in-situ.	Not effective. Limited effectiveness in vadose zone soils. Requires anaerobic conditions.	Implementable. A culture and electron donor injection system can be installed.	Moderate capital, moderate O&M cost.	Eliminated due to effectiveness concerns.
	Phytoremediation	Plant select vegetation on areas of impacted soil. The vegetation removes or metabolizes contaminants from soil through root systems.	Not effective. Experimental technology, likely long remedial time-frame.	Implementable. Select vegetation could easily be planted at the Site.	Low capital, low O&M cost.	Eliminated due to effectiveness concerns.
In-situ Physical	Electrical resistive heating	Polyphase electrical technique that uses electricity to resistively heat soil. Heating between the electrodes also creates an in-situ source of steam to strip VOCs and SVOCs from subsurface soils. Soil vapor extraction is then used to capture the off-gases for above-ground treatment. Effective in vadose zone soils and in saturated soils.	Effective for VOCs. Not effective for PCBs.	Implementable. Applicable to concentrated source zone; not practicable to apply site-wide.	Moderate capital, moderate O&M cost.	Retained. Due to application of system, this technology will be integrated into a source zone / groundwater remedial alternative.
	Soil vapor extraction	Vadose zone vacuum wells are used to remove volatile contaminants from soil. Extracted vapors are treated with activated carbon or a thermal oxidizer.	Effective for VOCs. Not effective for PCBs.	Implementable. More effective in coarse-grained soils than fine-grained soils, but issue can be handled in design.	Moderate capital, moderate O&M cost.	Retained. Would be used as part of electrical resistive heating.
	Air sparging	Air is bubbled through impacted source zone and groundwater. Air stream strips volatile contaminants from the groundwater. Vapors are captured and treated.	Not Effective, because of difficulty in capturing volatiles given heterogeneous nature of subsurface materials. Injections of air (oxygen) will reduce intrinsic anaerobic bioremediation, if any.	Implementable.	Moderate capital, moderate O&M.	Eliminated due to limited effectiveness.
In-situ Chemical	In-situ chemical oxidation	Inject or use soil mixing technology to introduce potassium permanganate into vadose zone soil, source zone, and groundwater to destroy contaminants.	Not effective for VOCs or PCBs in unsaturated soils. Oxidant could not be effectively distributed in the vadose zone. Limited ability to re-capture and extract liquids. Effective for VOCs in saturated zone soils and groundwater. Contaminants can be oxidized provided the oxidant can be effectively delivered to contaminated areas. Difficult to access and treat contamination in fine-grained soil units.	Not implementable for unsaturated soil remediation because of lack of effectiveness. Implementable for saturated zone and groundwater.	High capital, moderate O&M.	Retained, but will work only in saturated zone soils and groundwater.

TABLE 5-1 (continued)
IDENTIFICATION AND SCREENING OF TECHNOLOGIES
4144 GLENCOE AVENUE SITE
LOS ANGELES, CALIFORNIA

TECHNOLOGY TYPE	TECHNOLOGY	DESCRIPTION	SCREENING CRITERIA			COMMENTS
			EFFECTIVENESS	IMPLEMENTABILITY	COST	
	Permeable reactive barrier (PRB)	A vertical trench is excavated into shallow bedrock and backfilled with a mixture of permeable sands and zero-valent iron. Impacted groundwater flows laterally through the wall where organic contaminants are oxidized by the iron. Not useful for stationary DNAPL.	Effective, specifically in treating VOCs. May create by-products.	Implementable.	High capital, minimal O&M.	Retained.
	Surfactant flushing	Inject a surfactant to flush or “wash” contaminants from soils. Surfactant with entrained contaminants is collected at depth and pumped to surface for appropriate treatment and disposal.	Not effective for VOCs or PCBs in vadose zone soils. Surfactant likely could not be effectively distributed in the vadose zone. Limited ability to re-capture and extract liquids.	Not implementable. Lack of effectiveness precludes implementability for vadose soil remediation at the Site.	High capital, moderate O&M.	Eliminated due to effectiveness concerns.
Ex-situ Treatment	Pump and treat	Extract contaminants from groundwater and source zone with wells or a trench. Treat aboveground with granular activated carbon or an air stripper.	Not effective. Although it can help control lateral migration in source zone and groundwater, pump and treat is not demonstrated to be effective at reducing DNAPL significantly.	Not implementable. Lack of effectiveness precludes implementability for groundwater and source zone remediation at the Site	Moderate capital, high O&M.	Eliminated due to effectiveness, implementability and cost.
Containment	Slurry or sheet pile wall	Vertical trench excavated down to bedrock and backfilled with low permeability clay slurry as a physical barrier to lateral groundwater flow. Sheet pile can also be driven to provide similar effect.	Effective. Limits lateral flow of groundwater, however, may cause groundwater mounding which could affect flow gradients.	Implementable.	High capital, minimal O&M.	Eliminated due to cost.
Capping	Low permeability clay layer	Mitigate contact with impacted soils, rainwater infiltration, and reduce vapor migration to surface by constructing a low permeability clay barrier, a geosynthetic membrane, or a fabric-reinforced asphalt layer over the area of impacted soils.	Effective for all COCs.	Implementable. May require restriction on future land use.	Moderate capital, low O&M cost.	Retained.
	Geosynthetic membrane		Effective for all COCs.	Implementable. May require restriction on future land use.	Moderate capital, low O&M cost.	Retained.
	Asphalt cap		Effective for all COCs.	Implementable. May require restriction on future land use.	Moderate capital, low maintenance cost.	Retained.
Excavation	Excavation	Excavate PCB impacted shallow soils and PCB impacted soils within source zone. Backfill excavation with imported soil. Dispose of soil in Class I landfill, non-hazardous landfill, or TSCA cell, depending upon waste classification.	Effective for all COCs.	Implementable. Potential major difficulties due to traffic and dust. Major difficulties due to VOC emissions if excavation is performed prior to remediation of VOCs.	High capital, minimal O&M.	Retained.
Engineered Controls	Vapor control systems	Install subsurface barriers and vapor control systems to mitigate soil vapor migration into structures.	Effective for VOCs. Not necessary for PCBs.	Implementable. May be implemented in combination with other technologies.	Low capital, low O&M.	Retained.

TABLE 5-1 (continued)
IDENTIFICATION AND SCREENING OF TECHNOLOGIES
4144 GLENCOE AVENUE SITE
LOS ANGELES, CALIFORNIA

TECHNOLOGY TYPE	TECHNOLOGY	DESCRIPTION	SCREENING CRITERIA			COMMENTS
			EFFECTIVENESS	IMPLEMENTABILITY	COST	
Ex-Situ Treatment	Low temperature thermal desorption (LTTD)	Excavate impacted soils and treat off-site by heating soils to volatilize contaminants. The excavation is backfilled with the treated soil.	Effective for VOCs. Not effective for PCBs.	Implementable. Potential major difficulties due to traffic, dust & emissions	High capital, minimal O&M.	Eliminated due to effectiveness concerns with PCBs, implementability issues, and because of excessive cost.
	Incineration	Excavate impacted soils and send to offsite incineration plant for treatment where contaminants in soils are destroyed at high temperatures. Backfill excavation with imported soils.	Effective.	Implementable. Potential major difficulties due to traffic, dust, and emissions.	High capital, minimal O&M cost.	Eliminated due to high cost.
	Chemical Stabilization	Excavate soils containing contamination and chemically treat soils to bind contaminants into a concrete-like matrix.	Not Effective. Does not reduce mobility of or remediate VOCs or PCBs.	Implementable. Would require soils handling and create significant on-site management issues such as dust and emissions.	High capital, minimum O&M.	Eliminated due to effectiveness concerns as well as excessive cost.

Notes: VOC = Volatile Organic Compounds.
SVOC = Semi-Volatile Organic Compounds.
RI/FS = Remedial Investigation/Feasibility Study.
O&M = Operation and Maintenance.

TABLE 5-2

**RETAINED TECHNOLOGIES
4144 GLENCOE AVENUE
LOS ANGELES, CALIFORNIA**

TECHNOLOGY TYPE	TECHNOLOGY	COMMENTS
No Action	No Action	Retained as required by RI/FS guidance
Institutional Controls	Deed restriction on type of future development and use of the 4144 Glencoe Avenue Site.	Retained
In-situ Physical	Electrical resistive heating	Retained
	Soil vapor extraction	Retained
In-situ Chemical	In-situ chemical oxidation	Retained
	Permeable reactive barrier	Retained
Capping	Low permeability clay layer	Retained
	Geosynthetic membrane	Retained
	Asphalt cap	Retained
Excavation	Excavation of PCB impacted soil	Retained
Engineered Controls	Vapor control systems	Retained

TABLE 6-1
ASSEMBLY OF PRELIMINARY REMEDIAL ALTERNATIVES
4144 GLENCOE AVENUE SITE
LOS ANGELES, CALIFORNIA

Technology Type	Technology	Area or Volume	Preliminary Remedial Alternatives*						
			P1	P2	P3	P4	P5	P6	P7
No Action	No action	N/A	♦						
Capping	Low permeability clay, geosynthetic, or asphalt cap	Soils exceeding a risk range of 1×10^{-6} for future onsite residents, and/or 1×10^{-5} for onsite landscapers and utility workers.		♦	♦	♦			
Selective Excavation	Excavation of PCB impacted soil.	Soils exceeding a risk range of 1×10^{-6} for future onsite residents, and/or 1×10^{-5} for onsite landscapers and utility workers.					♦	♦	♦
No Action	No Action	N/A	♦						
In-situ Physical	Electrical resistive heating	At accessible areas of high concentration and in the source zone.		♦			♦		
In-situ Chemical	In-situ chemical oxidation via injection wells.	At accessible areas of high concentration and in the source zone.			♦			♦	
	Permeable reactive barrier	At accessible areas of high concentration and in the source zone.				♦			♦

*Preliminary Remedial Alternatives:

- 1 No Action
- 2 Capping with Electrical Resistive Heating
- 3 Capping with In-Situ Chemical Oxidation
- 4 Capping with Permeable Reactive Barrier
- 5 Selective Excavation with Electrical Resistive Heating
- 6 Selective Excavation with In-Situ Chemical Oxidation
- 7 Selective Excavation with Permeable Reactive Barrier

Except for Alternative 1, each Preliminary Remedial Alternative includes the following elements:

- Institutional controls on property.
- Engineered controls for residences overlying areas with a risk $> 1 \times 10^{-6}$ for future on-site residents, and $> 1 \times 10^{-5}$ for on-site landscapers and utility workers.
- Groundwater monitoring will be instituted to monitor the dissolved phase plume.

TABLE 6-2

**FINAL REMEDIAL ALTERNATIVES
4144 GLENCOE AVENUE
LOS ANGELES, CALIFORNIA**

Technology Type	Technology	Area or Volume	Final Remedial Alternatives*		
			1	2	3
No Action	No Action.	N/A	•		
Selective Excavation	Excavation of PCB impacted soil.	Soils exceeding a risk range of 1×10^{-6} for future onsite residents, and/or 1×10^{-5} for onsite landscapers and utility workers.		•	•
No Action	No Action.	N/A	•		
In-situ Physical	Electrical resistive heating.	At accessible areas of high concentration and in source zone.		•	
In-situ Chemical	In-situ chemical oxidation via injection wells.	At accessible areas of high concentration and in source zone.			•
Institutional Controls	Prohibit sensitive land uses, specify new building construction, and prohibit on-site groundwater extraction.	Footprint of future commercial/second-story residential structures overlying area with risk $> 1 \times 10^{-6}$ for future on-site residents or risk $> 1 \times 10^{-5}$ for future landscapers and utility workers.		•	•
Engineering Controls	Vapor control systems.	Employed for residences overlying areas with a risk $> 1 \times 10^{-6}$ for future on-site residents, and $> 1 \times 10^{-5}$ for on-site landscapers and utility workers		•	•
Groundwater Monitoring	Groundwater monitoring.	Key wells to monitor dissolved phase plume.		•	•

* Final Remedial Alternatives:

- 1 No Action (formerly preliminary remedial alternative P1)
- 2 Selective Excavation with Electrical Resistive Heating (formerly preliminary remedial alternative P5)
- 3 Selective Excavation with In-Situ Chemical Oxidation (formerly preliminary remedial alternative P6).

Alternatives 2 and 3 include the following elements:

- Institutional controls on property.
- Engineered controls for residences overlying areas with a risk $> 1 \times 10^{-6}$ for future on-site residents, and $> 1 \times 10^{-5}$ for on-site landscapers and utility workers.
- Groundwater monitoring will be instituted to monitor the dissolved phase plume.

TABLE 7-1
FEDERAL ARARs
4144 GLENCOE AVENUE SITE
LOS ANGELES, CA

Citation	Standard or Requirement	Description	Potentially Applicable or Relevant and Appropriate	Comment
Safe Drinking Water Act (40 USC Section 300)				
40 CFR Part 141 Subpart B	National Primary Drinking Water Standards	<p>Establishes maximum contaminant levels (MCLs) which are health based standards for public water systems. EPA has promulgated MCLs for inorganic chemicals (41 CFR 141.11), organic chemicals (41 CFR 141.12), turbidity (41 CFR 141.13) and radioactivity (41 CFR 141.15).</p> <p>The SDWA also establishes secondary standards for sources of public drinking water. These Maximum Contaminant Level Goals (MCLGs) are non-promulgated and generally non-enforceable standards. They are, however, intended to provide guidance as to levels of contamination that are protective of human health; and pursuant to CERCLA § 121(d)(2)(A) remedial actions selected at CERCLA sites must require a level or standard of control which at least attains MCLGs established under the SDWA and water quality criteria established under sections 304 or 303 of the Clean Water Act, where such goals or criteria are relevant and appropriate under the circumstances of the release or threatened release.</p> <p>In determining the relevance and appropriateness of MCLGs, the most important factors to consider are the designated uses of the water and the purpose for which the potential requirements are intended. Regulations promulgated by EPA require that MCLGs that are set at non-zero levels "shall be attained by remedial actions for groundwater or surface water that are current or potential sources of drinking water, where the MCLGs are relevant and appropriate to the circumstances of the release based on the factors in [40 CFR] § 300.400(g)(2). If an MCLG is determined not to be relevant and appropriate, the corresponding MCL shall be attained where relevant and appropriate to the circumstances of the release." 40 CFR § 300.430(e)(2)(B). Thus, MCLGs are potential ARARs even though not generally enforceable.</p>	Yes	May be relevant or appropriate if affected groundwater is a drinking water source.

TABLE 7-1 (cont.)
FEDERAL ARARs
4144 GLENCOE AVENUE
LOS ANGELES, CA

Citation	Standard or Requirement	Description	Potentially Applicable or Relevant and Appropriate	Comment
Safe Drinking Water Act (40 USC Section 300)				
40 CFR Part 143	National Secondary Drinking Water Standards	The SDWA established National Secondary Drinking Water Regulations consisting of Secondary Maximum Contaminant Levels (SMCLs). These standards are set to regulate aesthetic qualities of drinking water (e.g., odor, color). SMCLs are nonenforceable guidance and are therefore TBCs for the Site.	Yes	May be relevant or appropriate if affected groundwater is a drinking water source.
40 CFR Part 144	Underground Injection Control (UIC) Program	<p>UIC provides substantial requirements and permit requirements for construction and operation of underground injection wells. The technical and procedural requirements vary according to the class of well installed. These include construction, operating, monitoring, and closure requirements.</p> <p>Since reinjection of extracted groundwater is not within 1/4 mile of an underground drinking water source, the injection wells would be classified as either a Class IV well or a Class V well depending on the nature of the material reinjected. Class IV wells allow injection of nonhazardous wastewater into an aquifer as part of a CERCLA remedial action (40 CFR 144.13). No construction, operation, monitoring or closure criteria are established for Class IV wells (40 CFR 146, Subpart E). Class V wells inject non-hazardous materials.</p> <p>SDWA also authorized the UIC permit program (40 CFR 144). This program requires owners and operators of certain classes of underground injection wells to obtain permits in order to operate the wells. The permit applicant must show that the underground injection will not endanger drinking water sources.</p>	Yes	If reinjection takes place in wells that are installed entirely on Site, no UIC permits would be required, but the substantive provisions of the program would be applicable. Alternatively, if some reinjection wells discharge into areas of groundwater units that are not part of the Site, both the substantive and administrative portions of the UIC would be applicable.

TABLE 7-1 (cont.)
FEDERAL ARARs
4144 GLENCOE AVENUE
LOS ANGELES, CA

Citation	Standard or Requirement	Description	Potentially Applicable or Relevant and Appropriate	Comment
Safe Drinking Water Act (40 USC Section 300)				
		<p>Any wells constructed off Site would be required to be permitted by the appropriate state agency or EPA and to comply with the UIC permit program. All Class I, III, IV, and V wells under the UIC program are administered by EPA. 40 CFR § 147.251. Only Class II wells are administered by the State of California.</p> <p>The permitting provisions of 40 CFR Part 144 contain only a few specific requirements for Class IV wells (which are otherwise generally prohibited but are granted an exception for CERCLA corrective actions). These provisions would not be fully applicable for off-site wells if the wells are determined to be Class V wells. Other permit conditions that relate to all classes of injection wells under the UIC would be applicable for injection wells located off-site. See e.g., 40 CFR Subpart E.</p>		
40 CFR Part 131	Ambient Water Quality Criteria (WQC)	<p>CERCLA § 121 requires that a remedial action attain Water Quality Criteria (WQC) where such releases are relevant and appropriate under the circumstances. WQC are non-enforceable guidance developed under the CWA and are used by the state, in conjunction with a designated use of a surface water segment, to establish water quality standards under CWA § 303. WQC established under Section 304 of CWA (51 FR 43665), are nonpromulgated guidance values based on effects on human health and aquatic life that do not reflect technological or economic considerations.</p> <p>CWA WQCs would pertain to water discharged to, or site runoff directed to, a water body (including a storm drain or flood channel) and surface water containing contaminated sediments from the Site with or without treatment.</p>	Yes	Ambient WQC for some of the organic and inorganic contaminants in the groundwater at the site have been developed. Substantive requirements would apply if contaminated or treated groundwater is discharged to surface water during a remedial action.

TABLE 7-1 (cont.)
FEDERAL ARARs
4144 GLENCOE AVENUE
LOS ANGELES, CA

Citation	Standard or Requirement	Description	Potentially Applicable or Relevant and Appropriate	Comment
Safe Drinking Water Act (40 USC Section 300)				
40 CFR Parts 122 and 125	National Pollutant Discharge Elimination System Permit Regulations	Requires permits for the discharge of pollutants from any point source into waters of the United States (U.S.). Both on-site and off-site storm water discharges from CERCLA sites to surface waters are required to meet the substantive CWA NPDES requirements, including discharge limitations, monitoring requirements, and best management practices. Off-site stormwater or process discharges to surface waters must be NPDES-permitted. Stormwater runoff from the site does not need an NPDES permit (40 CFR 122.26). Surface water discharge requirements (except permitting) are applicable regulations for stormwater discharges.	Yes	A permit is not required for on-site CERCLA response actions, but the substantive requirements would apply if treated groundwater is discharged to surface water during a remedial action.
40 CFR Parts 403 and 414	National Pretreatment Standards	Standards control the introduction of pollutants which pass through or interfere with treatment processes in publicly owned treatment works (POTWs). This prevents interference with the operation of a POTW, prevents pass through of pollutants through the treatment works, and improves opportunities to recycle and reclaim municipal and industrial wastewater and sludges.	Yes	If an alternative involves discharge to publicly owned treatment works, these substantive standards would be applicable.
CWA § 402 (a)(1)	Water Quality Standards	Effluent limitations are required to achieve all appropriate state water quality standards. EPA "Policy for the Development of Water Quality-Based Permit Limitations for Toxic Pollutants" (49 FR 9016, March 9, 1984) states that toxic pollutants contained in direct discharges will be controlled beyond Best Available Technology (BCT/BAT) equivalents in order to meet applicable state water quality standards. Section 303 of the CWA requires states to promulgate water quality standards. Discharges to the storm drain pertain here, such as site rainwater runoff. TBC for reinjection of groundwater in absence of direct discharge.	Yes	To be considered for reinjection of groundwater in absence of other ARARs.

TABLE 7-1 (cont.)
FEDERAL ARARs
4144 GLENCOE AVENUE
LOS ANGELES, CA

CWA 402(p)	Storm Water Discharge Requirements	<p>The Water Quality Act of 1987 added Section 402(p) to the CWA. See 33 U.S.C. § 1342(p). Section 402(p) establishes a framework for regulating industrial storm water discharges under the NPDES program. Of the five types of stormwater discharges required to have permits under Section 402(p), only one is relevant to the Site -- Section 402(p) prohibits any discharge that EPA or the state determines "contributes to a violation of a water quality standard or is a significant contributor of pollutants to the waters of the United States." CWA § 402(p)(2)(E).</p> <p>California has been authorized to implement the NPDES program for the state and the State Water Resources Control Board (SWRCB) has issued regulations governing storm water permitting under the CWA. See 40 CFR § 122.26(b)(14) (industries covered by the SWRCB's general permit requirements are coextensive with those covered by the federal permit program). A discussion of the substantive requirements of the SWRCB's storm water discharge requirements are discussed below under the state ARARs.</p>	No	Remedial activities that result in a surface water discharge are expected to be conducted entirely on-site; it will not be required to meet the administrative or permitting requirements of this provision.
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TABLE 7-1 (cont.)
FEDERAL ARARs
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Citation	Standard or Requirement	Description	Potentially Applicable or Relevant and Appropriate	Comment
Clean Air Act (CCA)				
40 CFR Part 50	National Ambient Air Quality Standards (NAAQS)	<p>National primary and secondary ambient air quality standards are defined under Section 109 of the CAA and are listed in 40 CFR 50.</p> <p>CERCLA sites are not considered major sources under the CAA unless emissions equal or exceed 100 tons per year of the pollutants for which the area is designated non-attainment. State implementation plans contain the specific regulations which govern the emission rates for such areas.</p>	Yes	These specific requirements are discussed in the table below relating to State and Local ARARs.
40 CFR Part 61	National Emission Standards for Hazardous Air Pollutants (NESHAPs)	<p>NESHAPs are process and industry specific. The NESHAP standards were promulgated to protect public health and the environment but are specific to industrial emissions. NESHAP standards are currently limited to very few chemicals for specific sources of those contaminants (40 CFR 61). The standard for benzene, the only chemical found at the Site for which a NESHAP standard exists varies depending upon the industrial process.</p> <p>The Fugitive Emission Source regulations of 40 CFR Subpart V (§ 61.240 to § 61.247) apply to equipment that is used in volatile hazardous air pollutant (VHAP) service. The VHAPs regulated under this subpart are benzene and vinyl chloride. This subpart only applies if VHAP equipment comes into contact with a VHAP in excess of 10% by weight.</p> <p>The overall concentration of benzene in extracted groundwater from the Site would be present at only a small fraction of the level of contamination intended to be regulated by this subpart. Consequently, these fugitive emission regulations are not appropriate for the major processes</p>	No	Since benzene is not anticipated to be present at levels regulated under NESHAPs, these standards are not applicable. Nor are NESHAPs relevant and appropriate for the remedial activities anticipated since the "fugitive leaks" regulations apply to equipment contacting benzene at concentrations greater than 10% by weight.

TABLE 7-1 (cont.)
FEDERAL ARARs
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Citation	Standard or Requirement	Description	Potentially Applicable or Relevant and Appropriate	Comment
Clean Air Act (CAA)				
40 CFR Part 6	Standards for Radionuclides	Radionuclides NESHAPS are established for five different source categories. Generally these categories are: underground uranium mines; facilities owned and operated by the Department of Energy; Nuclear Regulatory Commission (NRC) facilities, calciners and nodulizing kilns at elemental phosphorus plants; NRC licensed uranium mill tailings sites. Since none of these sources is similar to the anticipated Site remedial activities, these standards are not ARARs. However, to the extent that these standards indicate levels of emission of radionuclides such as radon-222 which may be emitted from the remedial processes, these standards would be TBCs.	No	To be considered for emission of radionuclides which may be emitted from remedial processes.
Toxic Substances Control Act (TSCA)				
40 CFR Part 761	PCB Manufacturing, Processing, Distribution in Commerce and Use Prohibitions	Regulates the storage and disposal, record keeping and reporting, and waste disposal record keeping and reporting for polychlorinated biphenyl (PCB)-contaminated wastes. Regulates the disposal requirements for PCB remediation wastes. PCB remediation wastes > 50 ppm and < 1000 ppm must be disposed of in a hazardous waste landfill permitted by EPA under section 3004 of RCRA, or by a State authorized under Section 3006 of RCRA, or in a PCB disposal facility approved under this part. PCB remediation wastes > 1,000 ppm must be disposed of in a PCB incinerator approved under this part.	Yes	Applicable for disposal of soils from PCB cleanups at the site where concentrations exceed 50 ppm.
Other Applicable Acts				
19 CFR 1910	Occupational Safety and Health Act (OSHA)	The application of OSHA is controlled by the National Contingency Plan (NCP) 40 CFR § 300.150. OSHA requirements under 19 CFR 1910.120 are applicable to worker exposures during response actions at CERCLA sites, except in states that enforce equivalent or more stringent requirements. Response actions under	Yes	Is relevant and appropriate in order to maintain worker safety and health while working on the Site.

TABLE 7-1 (cont.)
FEDERAL ARARs
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Citation	Standard or Requirement	Description	Potentially Applicable or Relevant and Appropriate	Comment
		<p>the NCP must comply with the provisions for response action worker safety and health in 29 CFR 1910.120. Federal OSHA requirements include: Construction Standards (29 CFR Part 1926), General Industry Standards (29 CFR Part 1926), General Industry Standards (29 CFR Part 1910), and the general duty requirements of OSHA § 5(a)(1) (29 USC § 654(2)(1).</p> <p>OSHA exposure limits are developed for 8-hour worker exposures; these standards however could be considered in the protection of people in their homes. Exceeding OSHA standards in a home is likely to be more hazardous than on-site worker exposures.</p>		
40 CFR 204, 205, 211	Noise Control Act of 1972 as amended by the Quiet Communities Act of 1978	Construction and Transportation equipment noise levels (e.g., portable air compressors, and medium and heavy trucks), process equipment noise levels and noise levels at the property boundaries of the project are regulated under this act State or local agencies typically enforce these levels.	Yes	Applicable to process equipment noise levels and noise levels at the properties boundaries.

TABLE 7-2
STATE AND LOCAL ARARs
4144 GLENCOE AVENUE SITE
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Citation	Standard or Requirement	Description	Potentially Applicable or Relevant and Appropriate	Comment
Hazardous Waste Control Act under the California Code of Regulations Title 22				
H&SC §§ 25100-25395 under 22 CCR 66300	Standards for management of Hazardous Wastes	<p>The HWCA has many elements that are intended to control hazardous wastes from their point of generation through accumulation, transportation, treatment, storage, and ultimate disposal. It is implemented largely through regulations under the California Code of Regulations (CCR), Title 22, Section 66300 <u>et seq.</u></p> <p>All surface impoundments, waste piles, and land treatment facilities must be designed, constructed, and maintained to withstand the maximum credible earthquake. The level of public health and environmental protection incorporated in the original design should not be decreased (67108(a) and (b)).</p>	Yes	Since there are no landfills in any groundwater remedial alternative, these regulations will only be TBC.
22 CCR §§ 66261.21 to 66261.24	Criteria for Identifying Hazardous Wastes	<p>If a chemical is either listed or tested and found to possess characteristics that are hazardous, then remedial actions must comply with the hazardous waste requirements under Title 22.</p> <p>Total Threshold Limit Concentrations (TTLCs) and Soluble Threshold Limit Concentrations (STLCs) have been established for selected toxics to be used in establishing whether waste is hazardous.</p>	Yes	If a chemical is either listed or tested and found hazardous, then remedial actions must comply with the hazardous waste requirements under Title 22.
22 CCR §§ 66262.10-66262.70	Standards Applicable to Generators of Hazardous Waste	An owner or operator who initiates a shipment of hazardous waste from a Transport, Storage, or Disposal (TSD) facility must comply with the generator standards established under Title 22, Chapter 12. These standards include keeping of manifests (66262.20), pre-transport requirements (66262.30), record keeping and reporting requirements (66262.00). This regulation is applicable to hazardous waste resulting from treatment of groundwater that accumulates on-site and is shipped off-site for disposal. This regulation is TBC for site activities which do not result in generation or disposal of hazardous waste. This regulation is TBC for site activities which do not result in generation or disposal of hazardous waste.	Yes	This regulation is applicable to hazardous waste resulting from treatment of groundwater that accumulates on-site and is shipped off-site for disposal.

TABLE 7-2 (cont.)
STATE AND LOCAL ARARs
4144 GLENCOE AVENUE SITE
LOS ANGELES, CA

Citation	Standard or Requirement	Description	Potentially Applicable or Relevant and Appropriate	Comment
22 CCR §§ 66263.10 to 66263.18	Standards Applicable to Transporters of Hazardous Waste	If hazardous wastes are generated through the treatment process and then must be transported off-site the substantive portions of these regulations would be applicable. The regulations require that transporters of hazardous waste; be registered, have the appropriate kinds of containers, adhere to mandated monitoring procedures, meet record keeping requirements, and take appropriate action in the even of a discharge.	Yes	Only transportation of hazardous waste off-site is required to meet these requirements.
22 CCR §§ 66264.10-66264.708	Standards For Owners and Operators of Hazardous Waste Transfer, Treatment, Storage, and Disposal Facilities	General facility standards (Article 2), Preparedness and Prevention Requirements (Article 3), Contingency Plan and Emergency Procedures (Article 4), and Manifest System (Article 5) are generally applicable for those treatment processes involved in soil remediation. ReInjection could be considered "disposal" if the "contained-in" rule is not applicable.	No	These provisions are not applicable to the Site itself, since it is not a TSDF, but would apply to those processes that treat, store or dispose of hazardous wastes.
22 CCR §§ 66264.90-66264.100 and 22 CCR §§ 66264.140-66264.143	Water Quality Monitoring and Response Program For Permitted Facilities; and Financial Requirements	Sets forth general requirements for groundwater monitoring of permitted TSDFs, concentration limits for monitoring, monitoring points, compliance period and evaluation program. The Site is not a TSDF, and as such the regulations are not fully applicable. The regulations may be relevant since they are intended to ensure adequate monitoring of the facilities while in operation and adequate closure at the end of facility's life to protect groundwater quality. These regulations are intended to ensure that the Site is adequately monitored while in use as a TSDF. TSDFs are generally intended to intentionally place wastes into the soil for disposal (often including surface impoundments or waste piles), or to hold and treat hazardous wastes. Such TSDFs require close monitoring both during operation and after closure to protect groundwater.	No	These regulations are not appropriate to the Site and are TBCs.

TABLE 7-2 (cont.)
STATE AND LOCAL ARARs
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Citation	Standard or Requirement	Description	Potentially Applicable or Relevant and Appropriate	Comment
22 CCR §§ 66264.110-66264.120	Closure and Post-Closure	Requires closure plans and general closure requirements for disposal and decontamination of equipment at closure.	Yes	Relevant and appropriate for decontamination of equipment at the Site.
22 CCR §§ 66264.170-*66264.199	Use and Management of Containers and Tank Systems	Containers used to transfer or store hazardous wastes must be compatible with wastes stored, managed appropriately, inspected, and designed and operated appropriately. Tank systems must meet design standards and provide for: containment and detection/monitoring of leaks, monitoring and inspection, and proper closure procedures.	Yes	Applicable for those alternatives which contemplate the usage of tanks and/or containers as part of the remedial alternative.
22 CCR §§ 66264.220-66264.318	Surface Impoundments; Waste Piles; Land Treatment; and Landfills	<p>The substantive provisions of Articles 11 through 14 of Title 22 pertain to design, operation, monitoring, inspection and closure of surface impoundments, waste piles, land treatment units, and landfills. These provisions are intended to apply to state permitted hazardous waste facilities of the types noted. The Site is none of these, and as such the regulations are not fully applicable. The regulations are relevant since they are intended to ensure adequate monitoring of the facilities while in operation and adequate closure.</p> <p><u>Surface Improvement</u></p> <p>The owner and operator of a surface impoundment must provide 2 liners and a leachate collection system. The bottom liner can be constructed of natural material with a permeability of no greater than 1×10^{-7} cm/s. Monitoring/inspection, Emergency/Contingency Plans, and Closure/Post closure care must be provided.</p> <p><u>Waste Piles</u></p> <p>Same general requirements as for surface impoundments. Liquids or materials containing free liquids may not be placed in pile. Design and operating requirements similar to Surface Impoundments, Monitoring and Inspection, and Closure/Post closure Care are described.</p> <p><u>Landfills</u></p>	No	Not relevant and appropriate because remedial alternatives do not propose a surface impoundment, waste pile or landfill on the Site. TBC to the extent the regulation provides guidance that is protective of human health and the environment regarding replacement of non-hazardous material into the site. Also, TBC because any waste piles will be only temporary as part of remedial alternatives.
		<u>Landfills</u>		

TABLE 7-2 (cont.)
STATE AND LOCAL ARARs
4144 GLENCOE AVENUE SITE
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Citation	Standard or Requirement	Description	Potentially Applicable or Relevant and Appropriate	Comment
		Same general requirements as for surface impoundments. Construction of new or replacement landfill units on-site requires: a liner of acceptable material strength and engineering design, a leachate collection system immediately above the liner, monitoring and inspection, and closure/post closure care.		
22 CCR § 66264.340-66264.351	Incinerators	Not applicable to groundwater remedial alternatives because incineration not contemplated as a process.	No	
22 CCR §§ 66264.600-66264.801	Miscellaneous Units; Environmental Monitoring and Response Programs; and Corrective Action For Solid Waste Management Units	The substantive provisions of Articles 16 through 17, and 19 (there is no Article 18) of Title 22 pertain to monitoring, permitting, and closure of miscellaneous units; permitting and required programs for environmental monitoring programs at permitted facilities; and corrective actions for solid waste management units. These provisions are intended to apply to state permitted hazardous waste facilities of the specific types regulated. The Site is none of these, and as such the regulations are not fully applicable. The regulations are relevant since they are intended to address units that are used to treat, store or dispose of hazardous wastes that are not otherwise addressed by regulations.	No	These regulations are not appropriate to the Site since the treatment and storage facilities associated with the remedial alternatives are otherwise addressed in Title 22. As such, these regulations are TBCs.
22 CCR §§ 66264.1030-66264.1036	Standards: Process Vents, Closed Vent Systems and Control Devices	Sets standards relating to process vents associated with, among other things, air or steam stripping operations that manage RCRA hazardous wastes with organic concentrations of at least 10 ppmw.	Yes	The substantive portions of this provision would be relevant and appropriate.

TABLE 7-2 (cont.)
STATE AND LOCAL ARARs
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Citation	Standard or Requirement	Description	Potentially Applicable or Relevant and Appropriate	Comment
22 CCR § 66264.1050-66264.1065	Standards: Pumps, Compressors, Relief Devices, Valves, etc.	Sets standards relating to process equipment that comes into contact with RCRA hazardous wastes with organic concentrations of at least 10 percent by weight. However, to be applicable, these provisions would require that the facility be subject to permitting requirements of Chapter 20. Since the treatment facility at the Site would not be subject to these permitting requirements, Article 28 is not fully applicable.	No	It sets standards for operation of process equipment similar to that anticipated in the remedial alternatives.
22 CCR §§ 66265.1-66265.714	Interim Status Standards for Owners and Operators of Hazardous Waste Transfer, Treatment, Storage and Disposal Facilities	The substantive provisions of Chapter 15 of Title 22 pertain to the same general requirements discussed above with respect to Chapter 14 of Title 22, only for Interim Status facilities. "Interim Status" is defined as that authorization granted by the DTSC or the EPA which allows a facility to continue to operate pending review and decision of the facility's permit application. See 22 CCR 66260.10. Any remedial operations performed entirely on-site do not require that a permit, but compliance is necessary with any substantive provisions of the permit requirement so these regulations are not fully applicable. Moreover, the provisions of Chapter 15 are duplicative of, and generally no more stringent than the provisions of Chapter 14 (discussed above).	No	Since these concerns are addressed by other relevant and appropriate regulations, substantive provisions of this chapter are TBCs.

TABLE 7-2 (cont.)
STATE AND LOCAL ARARs
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Citation	Standard or Requirement	Description	Potentially Applicable or Relevant and Appropriate	Comment
22 CCR §§ 66266.1-66266.120	Recyclable Materials	The substantive provisions of Chapter 16 of Title 22 pertain to recycling materials that are both economically and technologically feasible to be recycled. It is not expected that any waste streams from the remedial alternatives at the Site will be capable of being recycled as described in the regulations. The waste streams are expected to produce materials that are insufficient purity for resale or recycling. Consequently, this Chapter is not applicable. The intent of this Chapter is to utilize recycling to minimize the amount of hazardous waste that must ultimately be disposed. These regulations are also intended generally to apply to ongoing manufacturing operations and processes that are capable of recycling or reusing materials in the manufacturing process. The intent is to either destroy or safely dispose of these waste streams. The substantive provisions of this chapter are TBCs.	No	These regulations while relevant to minimization of disposal or waste products from ongoing plant operations are not appropriate to the Site remedial activities since facilities associated with the remedial action are generally not capable of reusing the waste stream from the process.
22 CCR §§ 66268.1-66268.124	Land Disposal Restrictions	<p>Specifies the restrictions that apply to the land disposal of certain kinds of wastes. The soil or debris variance from the land ban restrictions of Chapter 18 of Title 22 CCR § 66268.30 to § 66268.35 (exception for CERCLA corrective actions) expired in November 1990.</p> <p>The land disposal restrictions generally will apply as follows to groundwater or treatment residuals:</p> <ul style="list-style-type: none"> ● If the groundwater is itself and F002 RCRA-listed waste -- then the groundwater is banned from land disposal. 22 CCR § 66268.30(a). ● If the groundwater itself is not a RCRA-listed waste -- then the groundwater is banned from land disposal if it contains greater than 100 mg/kg HOCs. 22 CCR § 66268.32. 	Yes	Compounds prohibiting land disposal were detected in groundwater at the Site, the provisions of Chapter 18 will be applicable for remedial alternatives that anticipate the treatment and disposal of wastes containing contaminants in concentrations in excess of those allowed under this chapter.

TABLE 7-2 (cont.)
STATE AND LOCAL ARARs
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Citation	Standard or Requirement	Description	Potentially Applicable or Relevant and Appropriate	Comment
		<p>Chapter 18 specifies treatment requirements for HOCs that are present in concentrations greater than or equal to 1,000 mg/kg. 22 CCR § 66268.42. These treatment requirements will apply if the groundwater contains such concentrations of HOCs. Liquid wastes containing such concentration are required to be incinerated. Chapter 18 also specifies the residual concentration of a contaminant that can be contained in a liquid waste in order for that liquid to be land disposed.</p> <ul style="list-style-type: none"> ● If the groundwater contains (or is itself) the RCRA-listed waste "F002" then the maximum allowable concentration for land disposal of the waste or treatment residual is 0.15 mg/l (22 CCR § 66268.41(a)) (Table CCWE) (wastewater concentration). ● Liquid wastes containing less than 1,000 mg/kg of HOCs (which are not otherwise RCRA-listed) may be land disposed. 22 CCR § 66238.32(e). 		
22 CCR 67390.2	Deed Restrictions	Chapter 39 of Title 22 pertains to the designation of land as "contaminated property" and therefore restricted from certain future development. The provisions of this chapter were promulgated to implement Health & Safety Code §§ 25221, 25222.1, 25233, 25234. This chapter sets standards and factors that DTSC may consider in designating property as hazardous waste property as border zone property.	Yes	Because deed restrictions are anticipated to be a part of each remedial alternative (other than no action) the substantive provisions of this chapter are applicable.
19 CCR Ch. 3, Subch. 3	Hazardous Materials Release Response Plans and Inventory	Requires businesses that handle hazardous materials to establish a plan for emergency response to a release or threatened release of hazardous material. A handler would be required to report certain releases or threatened releases.	Yes	Applicable to disposal of hazardous materials resulting from treatment processes.

TABLE 7-2 (cont.)
STATE AND LOCAL ARARs
4144 GLENCOE AVENUE SITE
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Citation	Standard or Requirement	Description	Potentially Applicable or Relevant and Appropriate	Comment
Porter-Cologne Water Quality Control Act				
23 CCR 2200 to 2714	Water Code (WC)	Porter-Cologne delegates standard-setting authority to the RWQCBs. RWQCB will not dictate specific treatment alternatives but will require that the alternative meet minimum actions levels and perform at a level near the Best Available Technology (BAT) for the chosen alternative, RWQCB emission standards are set on a case-by-case basis and apply to treated wastewater and stormwater runoff. Regulations pertain to land disposal unit design and construction standards that minimize dangers to the waters of the State. Wastes are classified as hazardous, designated, non-hazardous, or inert and must be disposed of accordingly. Regulations regarding water quality protection standards are left to the Regional Water Quality Control Boards (2552). Standards are determined by the RWQCBs on a case-by-case basis based on federal Water Quality Standards and state action levels. Actions taken by public agencies to clean up pollution are exempt from the requirements of Title 23, provided that redispisal and containment meet applicable standards.	Yes	If met, these standards are not considered applicable but will remain relevant.
	Los Angeles RWQCB	Regional Boards may prescribe individual or general waste discharge requirements for discharges of site-specific, contaminant-specific, or inert wastes. The RWQCB often references and uses the DTSC action level (AL) standards when the RWQCB determines wastewater discharge standards for site-specific discharges. The RWQCB does not have their own list of ALs. The DTSC ALs is guidance and therefore to be considered (TBC).	Yes	Although the RWQCB applies and enforces the DTSC ALs, the discharge standards are still guidance and are not promulgated so are considered to be TBC.

TABLE 7-2 (cont.)
STATE AND LOCAL ARARs
4144 GLENCOE AVENUE SITE
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Citation	Standard or Requirement	Description	Potentially Applicable or Relevant and Appropriate	Comment
	LACSD Wastewater Ordinance, April 1, 1972 (as amended November 1, 1989)	<p>No person shall discharge to the Los Angeles County Sanitation District (LACSD) facilities wastewater containing constituents in excess of effluent limitations defined by the LACSD in its wastewater ordinances. Total Identifiable Chlorinated Hydrocarbons (TICH) allowed: "Essentially None." Additional criteria include maintaining temperature less than 140°F; pH between 6.0 and 12.0; a flow of material that will not settle or cause an obstruction; a concentration of PCBs not to exceed 0.02 mg/l; and not discharging materials that cause problems in sewer facilities including ammonia, biochemical oxygen demand (BOD), chemical oxygen demand (COD), total organic carbon (TOC), priority pollutants, suspended solids, and phenolic compounds. In addition, LACSD may set case by case effluent limitations on certain constituents, including toxic organics, to protect the public health or the LACSD's sewerage facilities.</p> <p>Discharges to Publicly Owned Treatment Works (POTWs) are considered off-site discharges and must meet both the substantive and procedural requirements for any remedial alternatives that include discharges to LACSD sewer system. Regulations for use of LACSD Sewerage Facilities require detailed plans and operating procedures for pretreatment facilities including accidental discharge procedures are submitted to the CSDOC for review.</p>	No	TBC because remedial alternatives do not include discharges to LACSD sewer systems.

TABLE 7-2 (cont.)
STATE AND LOCAL ARARs
4144 GLENCOE AVENUE SITE
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Citation	Standard or Requirement	Description	Potentially Applicable or Relevant and Appropriate	Comment
Resolution 68-16	State Water Resources Control Board (SWRCB) Antidegradation Policy	<p>The Antidegradation Policy states in part that: Whenever the existing quality of water is better than the quality established in policies as of the date on which such policies become effective, such existing high quality will be maintained until it had been demonstrated to the State that any change will be consistent with maximum benefit to the people of the State, will not unreasonably affect present and anticipated use of such water and will not result in water quality less than that prescribed in the policies.</p> <p>Resolution No. 68-16 has not been formally promulgated as a rule or regulation pursuant to the established policy making procedures of the California Water Code § 13147, so the resolution is not fully "applicable" as a rule or regulation. However, the Antidegradation Policy has been adopted by the SWRCB and the LARWQCB as a narrative standard of a water quality objective. The Antidegradation Policy states as a narrative standard the goal that "disposal of wastes into the water of the State shall be so regulated as to achieve the highest water quality consistent with maximum benefit to the people of the State.." Because the Antidegradation Policy states a goal for the nondegradation of groundwaters of the state, and because the soil remediation at the Site may impact the groundwater quality of aquifers underling the Site the Antidegradation Policy is relevant to the Site remedial activities</p> <p>The Antidegradation Policy is also appropriate for the various remedial alternatives for groundwater since the purpose of the policy is to preserve the quality of groundwater, and since the remedial alternatives for groundwater will have an impact on the groundwater aquifers underlying the Site.</p>	Yes	The policy states a goal for the nondegradation of groundwaters of the state and because the soil remediation at the Site may impact the groundwater quality of aquifers underling the Site, the Antidegradation Policy is relevant to the Site's remedial activities. Waiver of the Antidegradation Policy at the Site may be appropriate if the attainment is impracticable for several reasons, including the difficulty, excessive time frame and cost for removing of DNAPL.

TABLE 7-2 (cont.)

STATE AND LOCAL ARARs
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Citation	Standard or Requirement	Description	Potentially Applicable or Relevant and Appropriate	Comment
		<p>CERCLA § 121(d) provides that, under certain circumstances, ARARs may be waived. The NCP provides for a waiver of ARARs for remedial actions if achievement of the ARAR is technically impracticable. The waiver can be used if either of two criteria are met: (1) engineering feasibility, in which current engineering methods necessary to construct and maintain an alternative that will meet the ARAR cannot reasonably be implemented; and (2) reliability, in which the potential for the alternative to continue to be protective into the future is low, either because the continued reliability of technical and institutional controls is doubtful, or because of inordinate maintenance costs. A remedial alternative that is feasible might be deemed technically impracticable if it could only be accomplished at inordinate cost. <u>See CERCLA Compliance With Other Laws Manual: Interim Final (Part I)</u>, EPA/540/G-89/006 (August 1989), and <u>Overview of ARARs, Focus on ARAR Waivers</u>, EPA Publication 9234.2-03/FS (December 1989).</p>		
California Safe Drinking Water Act (Cal-SDWA)				
22 CCR 64435, 64444.5	Maximum Containment Levels (MCLs)	<p>The Cal-SDWA establishes three criteria for evaluating drinking water quality: drinking water standards (MCLs), advisory drinking water action levels (Als), and advisory applied action levels (AALs). The Cal-SDWA establishes limits for substances that may affect health or aesthetic qualities of water and apply "at the tap." The UBA, Gage, and Lynwood aquifers are not currently drinking water sources, therefore these limits are not applicable since they apply to drinking water and not groundwater itself.</p> <p>MCLs are promulgated to provide safe drinking water. Where the RWQCB has promulgated regulations that classify particular aquifers as potential sources of drinking water, these limits are relevant and appropriate to establish standards for remediation.</p>	Yes	These standards will be ARARs at the Site where they set limits more stringent than federal MCLs for aquifers that are potential sources of drinking water for which risk-based exposure limits are not appropriate.

TABLE 7-2 (cont.)
STATE AND LOCAL ARARs
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Citation	Standard or Requirement	Description	Potentially Applicable or Relevant and Appropriate	Comment
	Advisory Drinking Water Action Levels (ALs)	ALs are health base concentration limits established by the California Department of Health Services (DHS) to aid in limiting public exposure to substances not yet formally regulated. These standards are non-promulgated advisory standards, and are therefore not ARARs.	No	They are TBCs because they are intended to be protective of human health and the environment.
	Advisory Applied Action Levels (AALs)	AALs were developed by DHS to evaluate site risks to biological receptors. AALs can be referenced in the absence of other ARARs as TBCs.	No	AALs are also not promulgated advisory standards and are not ARARs.
H&SC § 25249.5 under 22 CCR § 12000	Toxic Enforcement Act (Proposition 65)	<p>Proposition 65 regulates discharges and exposures of chemicals known to the State of California to be carcinogenic or reproductive toxins. DTSC has adopted regulations regarding no observable effect levels (NOELs) for reproductive toxins and no significant risk levels (NSRLs) for carcinogens. The following chemicals detected in soils at the Site are identified as chemicals known to the State of California to cause cancer:</p> <p>DDT Chloroform BHC 1,4-Dichlorobenzene Tetrachloroethylene Benzene Trichloroethylene</p> <p>The following chemicals detected in soils at the Site are identified as chemicals known to the State of California to be reproductive toxins: Toluene</p>	Yes	This Act is potentially applicable because chemicals detected in groundwater at the Site are listed in Proposition 65, and because individuals may come into contact with these chemicals listed above.

TABLE 7-2 (cont.)
STATE AND LOCAL ARARs
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Citation	Standard or Requirement	Description	Potentially Applicable or Relevant and Appropriate	Comment
		However, Proposition 65 exempts from its warning requirements: "an exposure for which the person responsible can show that the exposure poses no significant risk assuming lifetime exposure at the level in question for substances known to the state to cause cancer, and that the exposure will have no observable effect assuming the exposure at one thousand (1,000) times the level in question for substances known to the state to cause reproductive toxicity..." H&S Code § 25249.10(c). An analysis would need to be performed to determine whether the risk levels expected to emanate from the groundwater treatment processes would release any of the above listed chemicals in concentration that would trigger Proposition 65, or whether the level of exposure would pose no significant risk for carcinogens or if the exposure is 1,000 times the NOEL for reproductive toxins.		
Mulford-Carrell Air Resources Act				
H&SC §§ 3900-44563 under 17 CCR 70200	Implemented by the local Air Quality Management Districts and overseen by the Air Resources Board	Ambient Air Quality Standards listed under Title 17, Sections 70200/70200.5. Ozone (1-hour) 0.09 ppm CO (8-hour) 9.0 ppm (1-hour) 20 ppm NO ₂ (1-hour) 0.25ppm SO ₂ (24-hour) 0.04ppm (1-hour) 0.25ppm PM ₁₀ (particulate matter <10 microns) (24 hour annual mean) 30 µg/m ³ Sulfates (24-hour) 50 µg/m ³ Lead (30-day) 25 µg/m ³ H ₂ S (1-hour) 1.5 µg/m ³ Vinyl Chloride (24-hour) 0.010 ppm	Yes	Although it sets no standards, this law is applicable because it gives authority to local agencies. These standards had intended to be protective of human health and consist of specific compounds they will be TBCs in the absence of other ARARs.

TABLE 7-2 (cont.)
STATE AND LOCAL ARARs
4144 GLENCOE AVENUE SITE
LOS ANGELES, CA

Citation	Standard or Requirement	Description	Potentially Applicable or Relevant and Appropriate	Comment
		Title 17, Section 93000 also identifies benzene and hexavalent chromium as toxic air contaminants at specific industrial locations not applicable to remedial alternatives considered here.		
	South Coast Air Quality Management District (SCAQMD) Rules and Regulations	<p><i>Regulation IV -- Prohibitions.</i> This Act assigns responsibility for the identification of air pollutants to the CDHS and ARB. The ARB and local air pollution control districts must then develop control measures reducing emissions of the identified pollutants.</p> <p>Rule 401 - Visible Emissions. Limits visible emissions from any point source to Ringelmann No. 1, or 20 percent opacity for 3 minutes in any hour.</p> <p>Rule 402 - Nuisance. Prohibits the discharge of any material (including odorous compounds) that causes injury, or annoyance to the public, property, or businesses or endangers human health, comfort, repose, or safety.</p> <p>Rule 403 - Fugitive Dust. Limits on-site activities so that the concentrations of fugitive dust at the property line shall not be visible at the downwind particulate concentration shall not be more than 100 micrograms per cubic meter, averaged over 5 hours, above the upwind particulate concentration. These requirements do not apply if the wind speed, averaged over 15 minutes, is above 15 miles per hour. The rule also requires every reasonable precaution to minimize fugitive dust and the prevention and cleanup of any material accidentally deposited on paved streets.</p>		Depending on the remedial alternative selected, these rules may be relevant and appropriate. With the exception of Rule 430 which is TBC.

TABLE 7-2 (cont.)
STATE AND LOCAL ARARs
4144 GLENCOE AVENUE SITE
LOS ANGELES, CA

Citation	Standard or Requirement	Description	Potentially Applicable or Relevant and Appropriate	Comment
		<p>Rule 430 - Breakdown Provisions. Rule 430 requires reporting of any breakdown which results in a violation of any rule in Regulations IV or XI within one hour after any such breakdown. The report must identify the time, specific location, equipment involved and the extent known, the cause of the breakdown. The estimated time of repairs must be reported as soon as possible thereafter. Within one week of the breakdown which causes a violation of any rule in Regulations IV or XI has been corrected, the operator shall submit a written report to the SCAQMD Director. Because this is an administrative rule, and because the operation of equipment is expected to be entirely on-site, this rule is a TBC.</p> <p>Rule 431.1, 431.2, 431.3 - Sulfur Content of Combustible Fuels. Establishes allowable sulfur contents for combustion fuels.</p> <p>Rule 473 - Disposal of Solid and Liquid Wastes. Incinerators designed to dispose of combustible refuse at burning rates greater than 50 kilograms per hour shall not release particulate matter in excess of 0.23 grams per cubic meter of gas calculated to 12 percent of carbon dioxide (472(b) and (c)).</p> <p>Rule 474 - Fuel-Burning Equipment Oxides of Nitrogen. Limits the concentration of oxides of nitrogen (as NO₂) to a range of 125 to 300 ppm for gaseous fuels and 225 to 400 ppm for solid and liquid fuels depending on equipment size.</p> <p>Rule 476 - Steam Generating Equipment. Prohibits discharge into the atmosphere of certain combustion contaminants from equipment having a heat input rate of more than 50 million BTU. May be applicable depending upon final size of steam generating equipment used for carbon reactivation.</p>		

TABLE 7-2 (cont.)
STATE AND LOCAL ARARs
4144 GLENCOE AVENUE SITE
LOS ANGELES, CA

Citation	Standard or Requirement	Description	Potentially Applicable or Relevant and Appropriate	Comment
		<p><i>Regulation X -- National Emission Standards for Hazardous Air Pollutants.</i> Implements the provisions of Part 61, Chapter I, Title 40, of the CFR under the supervision of SCAQMD executive Officer, if contaminants identified at the Site are listed.</p> <p><i>Regulation XI -- Source Specific Standards</i> Rules 1146 and 1146.1 - Emission of Oxides of Nitrogen from Industrial, Institutional and Commercial Boilers, Steam Generators, and Process Heaters and Emissions of Oxides of Nitrogen for Small Industrial, Institutional and Commercial Boilers, Steam Generators, and Process Heaters. Prohibits boilers, steam generators, and process heaters rated greater than 5 million BTU/hour (or between 2 million and 5 million for small operators) from discharging in excess of certain limits of nitrogen dioxide (NO₂). Requires emission compliance plan, compliance schedule and compliance determination.</p> <p>Rule 1150 – Excavation of Landfill Sites No person shall initiate excavation of an active or inactive landfill without Excavation Management Plan approved by the Executive Officer. The Plan shall, as a minimum, provide information regarding the quantity and characteristics of the material to be excavated and transported, and shall identify mitigation measures to be activated as necessary during excavation to ensure a that public nuisance condition does not occur. Mitigation measures shall be selected after consideration of the physical characteristics of the landfill. Such mitigation measures may include gas collection and disposal, baling, encapsulation, covering of the material, chemical neutralizing, or other measures approved by the Executive Officer.</p>		

TABLE 7-2 (cont.)
STATE AND LOCAL ARARs
4144 GLENCOE AVENUE SITE
LOS ANGELES, CA

Citation	Standard or Requirement	Description	Potentially Applicable or Relevant and Appropriate	Comment
		<p>Rule 1166 – Volatile Organic Compound Emissions from the Decontamination of Soils This rule sets requirements to control the emission of Volatile Organic Compounds (VOC) from excavating, grading, handling and treating VOC-contaminated soil as a result of leakage from storage or transfer operations, accidental spillage, or other deposition.</p> <p>Rule 1176 - Fugitive Emissions of Volatile Organic Compounds (VOCs). Limits leaks of VOCs from valves, fittings, pumps, compressors and other equipment at refineries, chemical plants and similar processing facilities. While not applicable to the Site, this rule may be relevant and appropriate depending on the remedial alternative selected and the contents of the treatment process pipelines.</p> <p><i>Regulation XIII -- New Source Review.</i> This regulation sets forth preconstruction review requirements for new or modified stationary sources, to ensure that the operation of such stationary sources does not interfere with progress in attainment of the national and state ambient air quality standards, without unnecessarily restricting the future economic growth within the district. NAAQS guidelines and emissions limits are on a case-by-case basis. The regulations include requirements for offsets and usage of BACT for certain types of discharges.</p>		

TABLE 7-2 (cont.)
STATE AND LOCAL ARARs
4144 GLENCOE AVENUE SITE
LOS ANGELES, CA

Citation	Standard or Requirement	Description	Potentially Applicable or Relevant and Appropriate	Comment
		<p><i>Regulation XIV -- Toxics and Other Non-Criteria Pollutants</i></p> <p>Rule 1401 - New Source Review of Carcinogenic Air Contaminants. The rule specifies limits for cancer risk and excess cancer cases from new stationary sources and modifications to existing stationary sources that emit carcinogenic air contaminants. The rule establishes allowable emission impacts for all such stationary sources requiring new permits pursuant to SCAQMD Rules 201 or 203. Best Available Control Technology for Toxics (T-BACT) will be required for any system where a lifetime (70 year) maximum individual cancer risk of one in one million or greater is estimated to occur. Limits are calculated using unit risk factors for specific contaminants. Groundwater contaminants identified at the Site that have identified unit risk factors include BHC, benzene, carbon tetrachloride, chloroform, methylene chloride, trichloroethylene, and 2,4,6-trichlorophenol.</p>		

TABLE 7-2 (cont.)
STATE AND LOCAL ARARs
4144 GLENCOE AVENUE SITE
LOS ANGELES, CA

Citation	Standard or Requirement	Description	Potentially Applicable or Relevant and Appropriate	Comment
California Coastal Act of 1976				
14 CCR §§ 13001-13600	Public Resources Code (PRC)	Regulates activities within, or that could discharge to the coastal zone.		TBC since the remedial activities will not take place within the "coastal zone" as defined by PRC § 30103
Other Applicable Acts				
Div. 6, Part 1, Chapt. 2, §§ 5650-5656	Fish and Game Code	Prohibits deposition of materials that are deleterious to fish, plant life or bird life where such substances can pass into the waters of the state. (5650(f))	Yes	Applicable for remedial activities which might result in a surface water discharge
H&S Code §§ 25159.10-25159.25	Toxic Injection Well Control Act (TIWCA)	<p>TIWCA regulates the discharge of hazardous wastes to land injection wells. The TIWCA's purpose is to prevent contamination of underground sources of drinking water from underground waste injection. The TIWCA would be applicable for remedial alternatives that contemplate the injection of water containing hazardous wastes that could migrate to sources of drinking water.</p> <p>The TIWCA expressly exempts from its provisions any injection well used to inject contaminated groundwater that has been treated and is reinjected into the same formation from which it is drawn for purposes of improving the quality of the groundwater if the reinjection is part of a federal remedial response action. The TIWCA is therefore not applicable but is a TBC.</p>	No	Contaminated groundwater will be treated onsite and reinjected into the same formation therefore TIWCA is not applicable but is a TBC.
		The risk assessment required under the "Hot Spot" Act is more stringent than that performed under the FS because the FS risk assessment calculated risks due to exposure to soil and groundwater at the Site, not risks attributable to treatment processes from the remedial alternatives.		

TABLE 7-2 (cont.)
STATE AND LOCAL ARARs
4144 GLENCOE AVENUE SITE
LOS ANGELES, CA

Citation	Standard or Requirement	Description	Potentially Applicable or Relevant and Appropriate	Comment
Labor Code, Sections 6300 <u>et seq.</u>	California Occupational Health and Safety Act	Establishes the requirements for worker safety and responsibility of employers. Cal-OSHA also establishes exposure limits that are more stringent if not equal to OSHA exposure limits.	Yes	Is relevant and appropriate in order to maintain worker safety and health while working on the Site.

TABLE 7-3
FINAL REMEDIAL ALTERNATIVE 2 - DETAILED COST SUMMARY
4144 GLENCOE AVENUE SITE
LOS ANGELES, CALIFORNIA

CAPITAL COSTS					
ITEM	Units	Unit (\$)	Qty	Extended (\$)	Assumptions
1. SHALLOW SOIL EXCAVATION (PCB Soil Above 17 PPM):			Excavate Site areas with PCBs >17 PPM to 10 ft (570 CY in place).		
General Costs					
Security ¹	Day	\$ 108	4	\$ 432	\$9/hr, 12 hrs/day (overnight), number of days from excavation duration total. Assumes 15 days for excavation and backfill of SVE trenches; 10 days for PCB excavation.
Health & safety - Air Monitoring ²	Day	\$ 1,500	2	\$ 3,000	
Materials Handling/Transportation Plan ²	Ea	\$ 15,000	1	\$ 15,000	
Subtotal				\$ 18,432	
Contractor & Misc. Overhead ³			10%	\$ 1,843	
Permitting ³			5%	\$ 922	
Engineering Design ³			20%	\$ 3,686	
Construction CQA ³			15%	\$ 2,765	
Contingency ³			20%	\$ 3,686	
Subtotal - General Costs				\$ 31,334	
Excavation Costs					
Mob/Demob ²	LS	\$ 5,000	1	\$ 5,000	
Emissions Control ²	LS	\$ 10,000	1	\$ 10,000	
Traffic Control ²	Day	\$ 520	2	\$ 1,040	Assumes 65/hr on-Site truck traffic manager, 8 hours per day.
On-Site Soil Excavation and Haul ¹	CY	\$ 5	900	\$ 4,050	Backhoe excavate & stockpile; 1.4 bulking factor.
TSCA/RCRA Facility Transportation and Disposal ⁵	Ton	\$ 129	1,440	\$ 185,760	1.6 tons per CY in place; includes \$42/ton CA BOE fee. Assumes soil to be disposed contains some residual VOCs.
Soil backfill, purchase and deliver ¹	CY	\$ 6	900	\$ 5,400	
Short haul, backfill ¹	CY	\$ 2	900	\$ 1,800	Dozer, 300 ft max. Use imported soils for backfill of the excavation.
Compaction ¹	CY	\$ 0.75	900	\$ 675	Sheeps foot roller 6 in. lift, 2 pass. Compact and grade to desired finish grade (assumed to be present grade).
Water for compaction ¹	Day	\$ 10	2	\$ 20	7,000 gal/day, \$1. per 100 CF.
Estimated duration ²	Day		2		The excavation will be performed 8 hours per day.
Subtotal				\$ 213,745	

TABLE 7-3
FINAL REMEDIAL ALTERNATIVE 2 - DETAILED COST SUMMARY
4144 GLENCOE AVENUE SITE
LOS ANGELES, CALIFORNIA

ITEM	Units	Unit (\$)	Qty	Extended (\$)	Assumptions
Contractor & Misc. Overhead ³			8%	\$ 17,100	
Permitting ³			5%	\$ 10,687	
Engineering Design ³			15%	\$ 32,062	
Construction CQA ³			10%	\$ 21,375	
Contingency ³			20%	\$ 42,749	
Subtotal - Excavation Costs				\$ 337,717	
Subtotal - Shallow Soil Excavation				\$ 369,052	
2. AUGER EXCAVATION					
Auger Excavate and Dispose ^{2,4}	LS	\$324,000	1	\$ 324,000	Auger excavation of a 20-ft diameter area from 10 ft bgs to 20 ft bgs. (Excludes top 10 ft bgs excavation, which is covered under shallow soil excavation).
Subtotal - Auger Excavate and Dispose				\$ 324,000	
3. ELECTRICAL RESISTIVE HEATING					
Installation and Operation ⁵	LS	\$500,000	1	\$ 500,000	
Subtotal - Electrical Resistive Heating				\$ 500,000	
4. POST-REMEDY VAPOR SURVEY					
Post-Remedy Baseline Survey ²	LS	\$ 20,000	1	\$ 20,000	
Subtotal - Post-Remedy Baseline Survey				\$ 20,000	
5. ENGINEERED CONTROLS					
Sub-Slab Venting System ²	SF	\$ 9.00	50,000	\$ 450,000	Includes geomembrane barrier and engineered transmissive layer (passive).
Subtotal - Engineered Controls				\$ 450,000	

TABLE 7-3
FINAL REMEDIAL ALTERNATIVE 2 - DETAILED COST SUMMARY
4144 GLENCOE AVENUE SITE
LOS ANGELES, CALIFORNIA

ITEM	Units	Unit (\$)	Qty	Extended (\$)	Assumptions
6. GROUNDWATER MONITORING					
Well Installation and Sampling ²	LS	\$15,000	1	\$ 15,000	
Subtotal - Groundwater Monitoring				\$ 15,000	
7. OTHER TASKS					
Five-Year Review ²	LS	\$ 20,000	1	\$ 20,000	
Electrical Resistive Heating Contingency Plan ²	LS	\$ 35,000	1	\$ 35,000	
Subtotal - Other Tasks				\$ 55,000	
FINAL REMEDIAL ALTERNATIVE 2 TOTAL CAPITAL COSTS					
Capital Costs Subtotal (Other Tasks Included)				\$ 1,733,052	
O&M Total 5-Yr Discounted NPV (see Table 7-3a)				\$ 43,295	
O&M Total 5-Yr Non-Discounted NPV (see Table 7-3a)				\$ 50,000	
TOTAL (NPV with 5-Yr O&M Discounted)				\$ 1,776,346	
TOTAL (NPV with 5-Yr O&M Non-Discounted)				\$ 1,783,052	

Notes¹ Cost based on Means guide² Cost based on professional experience³ Cost factor based on "A guide to developing and documenting cost estimates during the feasibility study", USEPA, July 2000⁴ Cost based on personal communication with vendor⁵ Cost based on estimate from vendor

TABLE 7-3a
ALTERNATIVE 2 - DETAILED COST
4144 GLENCOE AVENUE
LOS ANGELES, CALIFORNIA

OPERATION AND MAINTENANCE COSTS					
ITEM	Units	Unit (\$)	Qty	Extended (\$)	Assumptions
6. GROUNDWATER MONITORING					
Well Installation and Sampling ²	Yr	\$10,000	1	\$ 10,000	
FINAL REMEDIAL ALTERNATIVE 2 TOTAL OPERATION AND MAINTENANCE COSTS					
Capital Costs Subtotal				\$ 10,000	
Total Annual O&M Cost				\$ 10,000	
O&M Total 5-Yr Discounted NPV				\$ 43,295	Discount Rate = 5%
O&M Total 5-Yr Non-Discounted NPV				\$ 50,000	

Notes

- ¹ Cost based on Means guide
² Cost based on professional experience
³ Cost factor based on "A guide to developing and documenting cost estimates during the feasibility study", USEPA, July 2000
⁴ Cost based on personal communication with vendor
⁵ Cost based on estimate from vendor

TABLE 7-4
FINAL REMEDIAL ALTERNATIVE 3 - DETAILED COST
4144 GLENCOE AVENUE SITE
LOS ANGELES, CALIFORNIA

CAPITAL COSTS					
ITEM	Units	Unit (\$)	Qty	Extended (\$)	Assumptions
1. SHALLOW SOIL EXCAVATION (PCB Soil Above 17 PPM):				Excavate Site areas with PCBs >17 PPM to 10 ft (570 CY in place).	
General Costs					
Security ¹	Day	\$ 108	4	\$ 432	\$9 per hour, 12 hrs per day (overnight), number of days from excavation duration total. Assumes 15 days for excavation and backfill of SVE trenches and 10 days for PCB excavation.
Health & safety - Air Monitoring ²	Day	\$ 1,500	2	\$ 3,000	
Materials Handling/Transportation Plan ²	Ea	\$ 15,000	1	\$ 15,000	
Subtotal				\$ 18,432	
Contractor & Misc. Overhead ³			10%	\$ 1,843	
Permitting ³			5%	\$ 922	
Engineering Design ³			20%	\$ 3,686	
Construction CQA ³			15%	\$ 2,765	
Contingency ³			20%	\$ 3,686	
Subtotal - General Costs				\$ 31,334	
Excavation Costs					
Mob/Demob ²	LS	\$ 5,000	1	\$ 5,000	
Emissions Control ²	LS	\$ 10,000	1	\$ 10,000	
Traffic Control ²	Day	\$ 520	2	\$ 1,040	Assumes 65/hr on-Site truck traffic manager, 8 hours per day.
On-Site Soil Excavation and Haul ¹	CY	\$ 5	900	\$ 4,050	Backhoe excavate & stockpile; 1.4 bulking factor.
TSCA/RCRA Facility Transportation and Disposal ⁵	Ton	\$ 129	1,440	\$ 185,760	1.6 tons per CY in place; includes \$42/ton CA BOE fee. Assumes soil to be disposed contains some residual VOCs.
Soil backfill, purchase and deliver ¹	CY	\$ 6	900	\$ 5,400	
Short haul, backfill ¹	CY	\$ 2	900	\$ 1,800	Dozer, 300 ft max. Use imported soils for backfill of the excavation.
Compaction ¹	CY	\$ 0.75	900	\$ 675	Sheeps foot roller 6 in. lift, 2 pass. Compact and grade to desired finish grade (assumed to be present grade)
Water for compaction ¹	Day	\$ 10	2	\$ 20	7,000 gal/day, \$1. per 100 CF.
Estimated duration ²	Day		2		The excavation will be performed 8 hours per day.
Subtotal				\$ 213,745	

TABLE 7-4
FINAL REMEDIAL ALTERNATIVE 3 - DETAILED COST
4144 GLENCOE AVENUE SITE
LOS ANGELES, CALIFORNIA

Contractor & Misc. Overhead ³				8%	\$	17,100					
Permitting ³				5%	\$	10,687					
Engineering Design ³				15%	\$	32,062					
Construction CQA ³				10%	\$	21,375					
Contingency ³				20%	\$	42,749					
Subtotal - Excavation Costs					\$	337,717					
Subtotal - Shallow Soil Excavation					\$	369,052					
2. AUGER EXCAVATION											
Auger Excavate and Dispose ^{2,4}				LS	\$	324,000	1	\$	324,000	Auger excavation of a 20-ft diameter area from 10 ft bgs to 20 ft bgs. (Excludes top 10 ft bgs excavation, which is covered under shallow soil excavation).	
Subtotal - Auger Excavation					\$	324,000					
3. IN-SITU CHEMICAL OXIDANT INJECTION								Installation of a three injection wells to the base of the C aquitard			
Injection Well Installation											
Utility Location ²				day	\$	1,400	1	\$	1,400		
Mob/Demob ²				day	\$	300.00	4	\$	1,200		
Drill and Install Well ²				each	\$	3,000	3	\$	9,000		
Well Development ²				each	\$	480	3	\$	1,440	4 hrs/well at \$120/hr.	
Well Vaults ¹				each	\$	720	3	\$	2,160	Traffic rated locking vaults	
Soil Bin ⁵				Each	\$	800	1	\$	800		
RCRA Facility Transportation and Disposal ⁵				Ton	\$	124	7	\$	868	1.4 tons per CY in place; includes \$42/ton CA BOE fee.	
Development Water Storage Tank ⁵				Each	\$	1,200	1	\$	1,200		
RCRA Facility Transportation and Disposal ¹				Gal	\$	3	7,500	\$	22,500	1.4 tons per CY in place; includes \$42/ton CA BOE fee.	
Laboratory - Soil ²				sample	\$	150.00	1	\$	150	VOC testing only.	
Laboratory - Water ²				sample	\$	150.00	6	\$	900	VOC testing only.	
Equipment ²				day	\$	200.00	4	\$	800		
Sampling Supplies ²				per well	\$	100.00	3	\$	300		
Subtotal					\$	42,718					

TABLE 7-4
FINAL REMEDIAL ALTERNATIVE 3 - DETAILED COST
4144 GLENCOE AVENUE SITE
LOS ANGELES, CALIFORNIA

Contractor & Misc. Overhead³		10%	\$	4,272	
Permitting³		5%	\$	2,136	
Engineering Design³		20%	\$	8,544	
Construction CQA³		15%	\$	6,408	
Contingency		20%	\$	8,544	
Subtotal - Injection Well Installation			\$	72,621	
Treatment Performance Monitoring Well Installation					Installation of 4 GW monitoring wells for performance monitoring of the potassium permanganate injection.
Utility Location ²	Day	\$	1,400	1	\$ 1,400
Mob/Demob ²	Day	\$	300	4	\$ 1,200
Drill and Install Well ²	Ea	\$	2,500	3	\$ 7,500
Well Development ²	Ea	\$	480	3	\$ 1,440 4 hrs/well at \$120/hr.
Soil Bin ⁵	Each	\$	800	1	\$ 800
RCRA Facility Transportation and Disposal ⁵	Ton	\$	124	7	\$ 868 1.4 tons per CY in place; disposal cost includes roll off bins.
Laboratory - Water ²	Sample	\$	150	3	\$ 450 VOC testing only.
Equipment ²	Day	\$	200	3	\$ 600
Sampling Supplies ²	Per well	\$	100	3	\$ 300
Subtotal				\$	14,558
Contractor & Misc. Overhead³		10%	\$	1,456	
Permitting³		5%	\$	728	
Engineering Design³		15%	\$	2,184	
Construction CQA³		20%	\$	2,912	
Contingency³		20%	\$	2,912	
Subtotal - Treatment Performance Monitoring Well Installation			\$	24,749	
Subtotal - In-Situ Chemical Oxidation			\$	97,369	
4. POST-REMEDY VAPOR SURVEY					
Post-Remedy Baseline Survey ²	LS	\$	20,000	1	\$ 20,000
Subtotal - Post-Remedy Baseline Survey				\$	20,000

TABLE 7-4
FINAL REMEDIAL ALTERNATIVE 3 - DETAILED COST
4144 GLENCOE AVENUE SITE
LOS ANGELES, CALIFORNIA

5. ENGINEERED CONTROLS							
Sub-Slab Venting System ²	SF	\$	9.00	50,000	\$	450,000	Includes geomembrane barrier and engineered transmissive layer (passive).
Subtotal - Engineered Controls					\$	450,000	
6. GROUNDWATER MONITORING							
Well Installation and Sampling ²	LS		\$15,000	1	\$	15,000	
Subtotal - Groundwater Monitoring					\$	15,000	
7. OTHER TASKS							
Five-Year Review ²	LS	\$	20,000	1	\$	20,000	
Electrical Resistive Heating Contingency Plan ²	LS	\$	35,000	1	\$	35,000	
Subtotal - Other Tasks					\$	55,000	
FINAL REMEDIAL ALTERNATIVE 3 TOTAL CAPITAL COSTS							
Capital Costs Subtotal (Other Tasks Included)					\$	1,330,420	
O&M Total 5-Yr Discounted NPV (see Table 7-3a)					\$	343,295	
O&M Total 5-Yr Non-Discounted NPV (see Table 7-3a)					\$	350,000	
TOTAL (NPV with 5-Yr O&M Discounted)					\$	1,673,715	
TOTAL (NPV with 5-Yr O&M Non-Discounted)					\$	1,680,420	

Notes¹ Cost based on Means guide² Cost based on professional experience³ Cost factor based on "A guide to developing and documenting cost estimates during the feasibility study", USEPA, July 2000⁴ Cost based on personal communication with vendor⁵ Cost based on estimate from vendor

TABLE 7-4a
FINAL REMEDIAL ALTERNATIVE 3 - DETAILED COST
4144 GLENCOE AVENUE SITE
LOS ANGELES, CALIFORNIA

OPERATION AND MAINTENANCE COSTS					
ITEM	Units	Unit (\$)	Qty	Extended (\$)	Assumptions
2. IN-SITU CHEMICAL OXIDANT INJECTION					
Injection of Oxidant					
Bench Test ⁵	Each	\$ 10,000	1	\$10,000	
Mob/Demob ⁵	Day	\$ 5,000	12	\$60,000	3 days per injection event; 4 events
Potassium Permanganate Dosing ²	Each	\$ 40,000	4	\$160,000	Cost for chemicals + other injection costs/event; 4 events
Treatment System O&M ²	Yr	\$ 25,000	1	\$25,000	Labor & equipment.
Treatment System Rehabilitation ²	Yr	\$ 15,000	1	\$15,000	Address precipitate, etc.
Reporting ²	Yr	\$ 7,500	4	\$30,000	Assumes quarterly reporting.
Subtotal				\$300,000	
Subtotal Annual O&M Cost				\$300,000	Operation is for one year only
6. GROUNDWATER MONITORING					
Well Installation and Sampling ²	Yr	\$10,000	1	\$10,000	
Subtotal				\$10,000	
Subtotal Annual O&M Cost				\$310,000	
O&M Subtotal 5-Yr Discounted NPV				\$43,295	Discount Rate = 5%
O&M Subtotal 5-Yr Non-Discounted NPV				\$50,000	
O&M Total 5-Yr Discounted NPV				\$343,295	
O&M Total 5-Yr Non-Discounted NPV				\$350,000	

Notes¹ Cost based on Means guide² Cost based on professional experience³ Cost factor based on "A guide to developing and documenting cost estimates during the feasibility study", USEPA, July 2000⁴ Cost based on personal communication with vendor⁵ Cost based on estimate from vendor

TABLE 7-5

**FINAL REMEDIAL ALTERNATIVE DETAILED ANALYSIS
4144 GLENCOE AVENUE
LOS ANGELES, CALIFORNIA**

Evaluation Criterion	Alternative 1 (See Section 7.3.2)	Alternative 2 (See Section 7.3.3)	Alternative 3 (See Section 7.3.4)
	No Action	Selective Excavation and Electrical Resistive Heating	Selective Excavation and In-Situ Chemical Oxidation
Overall Protection of Human Health and the Environment	<ul style="list-style-type: none"> • Would not mitigate potential impacts associated with inhalation, ingestion, direct contact, or indoor air vapor migration exposures. • No further analysis performed. 	<ul style="list-style-type: none"> • Would mitigate primary human health exposure pathways. • Would mitigate the potential risk from soil vapors by destroying the mass of DNAPL and VOCs in the entire source zone and in groundwater. • Includes institutional and engineered controls as well as groundwater monitoring to mitigate residual risks after remediation is complete. • Institutional controls would prohibit sensitive land use, accommodate mixed-use redevelopment (first floor non-residential, upper floor residential), and prohibit on-site groundwater extraction. • Continued O&M of building vapor control systems would provide for overall protection of human health. • Groundwater monitoring would ensure plume stability and create awareness of any increase in VOC concentrations. 	<ul style="list-style-type: none"> • Would mitigate primary human health exposure pathways. • Would leave some VOCs in unsaturated soils and would not address all of the DNAPL and VOCs in the source zone and in groundwater. • Includes institutional and engineered controls as well as groundwater monitoring to mitigate residual risks after remediation is complete. • Institutional controls would prohibit sensitive land use, accommodate mixed-use redevelopment (first floor non-residential, upper floor residential), and prohibit on-site groundwater extraction. • Continued O&M of building vapor control systems would provide for overall protection of human health. • Groundwater monitoring would ensure plume stability and create awareness of any increase in VOC concentrations.
Compliance with ARARs	<ul style="list-style-type: none"> • N/A 	<ul style="list-style-type: none"> • Would comply with ARARs. 	<ul style="list-style-type: none"> • Would comply with ARARs.

TABLE 7-5 (cont.)

**FINAL REMEDIAL ALTERNATIVE DETAILED ANALYSIS
4144 GLENCOE AVENUE
LOS ANGELES, CALIFORNIA**

Evaluation Criterion	Alternative 1 (See Section 7.3.2)	Alternative 2 (See Section 7.3.3)	Alternative 3 (See Section 7.3.4)
	No Action	Selective Excavation and Electrical Resistive Heating	Selective Excavation and In-Situ Chemical Oxidation
Long-Term Effectiveness and Permanence	<ul style="list-style-type: none"> • N/A 	<ul style="list-style-type: none"> • Excavation removes PCB-impacted soil, resulting in an effective long-term permanent solution. • Electrical resistive heating would destroy source zone contamination in unsaturated and saturated areas. Would result in a long-term permanent solution. • Institutional controls, O&M of engineering controls, and groundwater monitoring would provide long-term, effective protection of human health. 	<ul style="list-style-type: none"> • Excavation removes PCB-impacted soil, resulting in an effective long-term permanent solution. • In-situ chemical oxidation would reduce most contaminant mass in the saturated zone of the source area, but not in the unsaturated zone. Would be helpful in achieving a long-term permanent solution. • Institutional controls, O&M of engineering controls, and groundwater monitoring would provide long-term, effective protection of human health.
Reduction of Toxicity, Mobility, and Volume Through Treatment	<ul style="list-style-type: none"> • N/A 	<ul style="list-style-type: none"> • Would provide for broad reduction of toxicity, volume, and mobility of chemicals through treatment in soil, source zone, and groundwater. • The rate of reduction of toxicity, mobility and volume is rapid with electrical resistive heating. 	<ul style="list-style-type: none"> • Would provide for some reduction of toxicity, volume, and mobility of chemicals through treatment in soil, source zone, and groundwater. Would leave some contaminants in source zone and in groundwater. • The rate of reduction of toxicity, mobility and volume is fairly rapid with in-situ chemical oxidation.

TABLE 7-5 (cont.)

**FINAL REMEDIAL ALTERNATIVE DETAILED ANALYSIS
4144 GLENCOE AVENUE
LOS ANGELES, CALIFORNIA**

Evaluation Criterion	Alternative 1 (See Section 7.3.2)	Alternative 2 (See Section 7.3.3)	Alternative 3 (See Section 7.3.4)
	No Action	Selective Excavation and Electrical Resistive Heating	Selective Excavation and In-Situ Chemical Oxidation
Short-Term Effectiveness	<ul style="list-style-type: none"> • N/A 	<ul style="list-style-type: none"> • Excavation of shallow soils and auger excavation would be accompanied by noise and safety issues. Dust from the moist soils would not be a significant issue, although there may be minor VOC emissions during excavation and well installation. • Electrical resistive heating would pose minor safety issues, readily manageable through prudent health and safety measures. 	<ul style="list-style-type: none"> • Excavation of shallow soils and auger excavation would be accompanied by noise and safety issues. Dust from the moist soils would not be a significant issue, although there may be minor VOC emissions during excavation and well installation. • Would be periodic deliveries of a reactive chemical oxidant (permanganate) to recharge the trench. • Each in-situ chemical oxidation recharge event would require maintaining a small exclusionary zone, for less than a day.
Implementability	<ul style="list-style-type: none"> • N/A 	<ul style="list-style-type: none"> • Can be performed with commonly available construction equipment and materials using trained contractors. Electrical resistive heating is a reliable, proven, and effective technology for destruction of DNAPL and VOCs. 	<ul style="list-style-type: none"> • Can be performed with commonly available construction equipment and materials using trained contractors. In-situ chemical oxidation is a reliable, proven, and effective technology for destruction of VOCs in saturated zones, but is ineffective in unsaturated zones. Less effective at treating DNAPL.
Cost	<ul style="list-style-type: none"> • N/A 	<ul style="list-style-type: none"> • Capital cost: \$1,733,000 • O&M cost (non-discounted): \$50,000 • Total cost (non-discounted O&M): \$1,783,100 	<ul style="list-style-type: none"> • Capital cost: \$1,330,500 • O&M cost (non-discounted): \$350,000 • Total cost (non-discounted O&M): \$ 1,680,500

TABLE 8-1

**FINAL REMEDIAL ALTERNATIVES– COMPARATIVE ANALYSIS
4144 GLENCOE AVENUE SITE
LOS ANGELES, CALIFORNIA**

Comparative Analysis Criterion	Alternative 1	Alternative 2	Alternative 3
	No Action	Selective Excavation and Electrical Resistive Heating	Selective Excavation and In-Situ Chemical Oxidation
Overall Protection of Human Health and the Environment	Does not meet threshold requirement.	Meets threshold requirement.	Meets threshold requirement.
Compliance with ARARs	Does not meet threshold requirement.	Meets threshold requirement.	Meets threshold requirement.
Long-Term Effectiveness and Permanence	N/A	High: 5	Moderate: 3
Reduction of Toxicity, Mobility, and Volume Through Treatment	N/A	High: 5	Moderate: 3
Short-Term Effectiveness	N/A	High: 5	High: 5
Implementability	N/A	High: 5	High: 5
Cost	N/A	Moderate: 3	Moderate: 3
State Acceptance	N/A	To be addressed when DTSC makes its final remedial decision and prepares the ROD.	
Community Acceptance	N/A	To be addressed when DTSC makes its final remedial decision and prepares the ROD.	
OVERALL RANKING	Does not meet threshold requirement.	High: 23	Moderate-to-High: 19

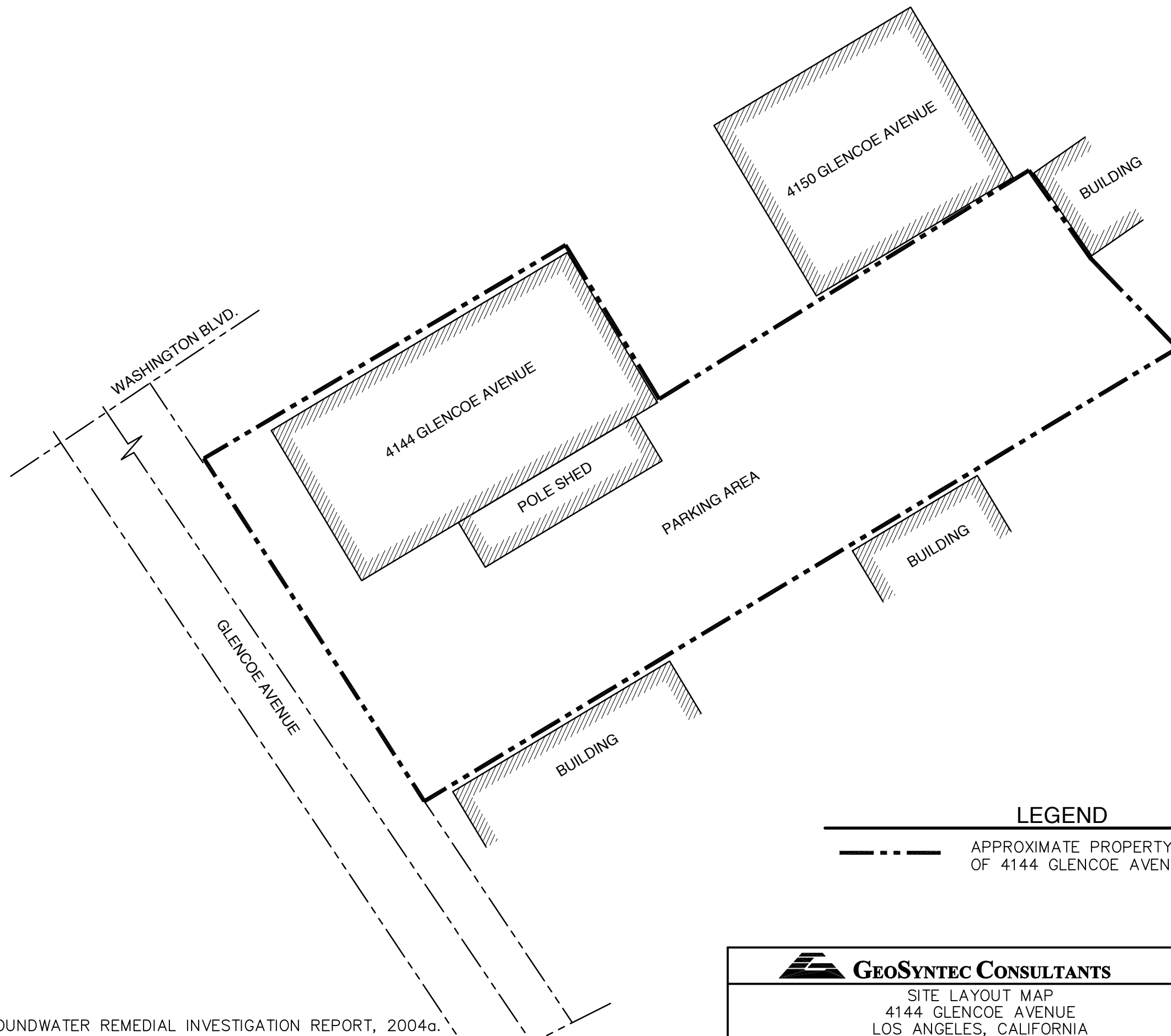
Note: a numeric ranking of “1” is lowest, or worst; “5” is highest, or best. With respect to cost, “1” is most expensive; “5” is least expensive.

N/A: Not Applicable.

FIGURES



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LEGEND



APPROXIMATE PROPERTY BOUNDARY
OF 4144 GLENCOE AVENUE SITE



0 25 50
SCALE IN FEET



GeoSYNTEC CONSULTANTS

SITE LAYOUT MAP
4144 GLENCOE AVENUE
LOS ANGELES, CALIFORNIA

FIGURE NO.	2-2
PROJECT NO.	HR0732
DATE:	JUNE 2005

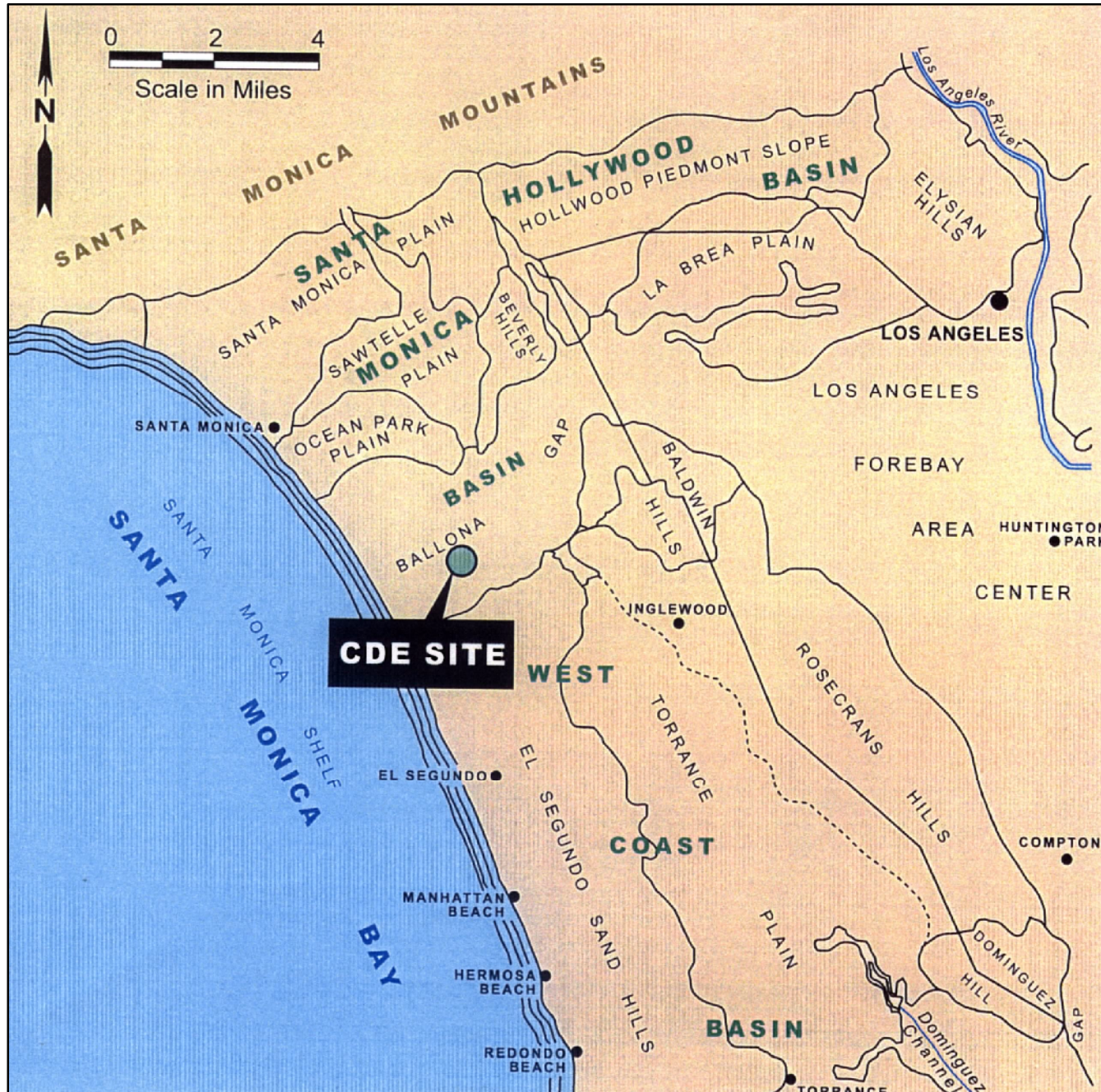
SOURCE: URS, GROUNDWATER REMEDIAL INVESTIGATION REPORT, 2004a.

APPROXIMATE PROPERTY
BOUNDARY OF 4144
GLENCOE AVENUE



SITE VICINITY MAP
4144 GLENCOE AVENUE
LOS ANGELES, CALIFORNIA

FIGURE NO.	2-3
PROJECT NO.	HR0732
DATE:	JUNE 2005



EXPLANATION:

- Boundary Between Physiographic Feature (Dotted Where Approximate or Poorly Defined)
- Boundary of Groundwater Basin

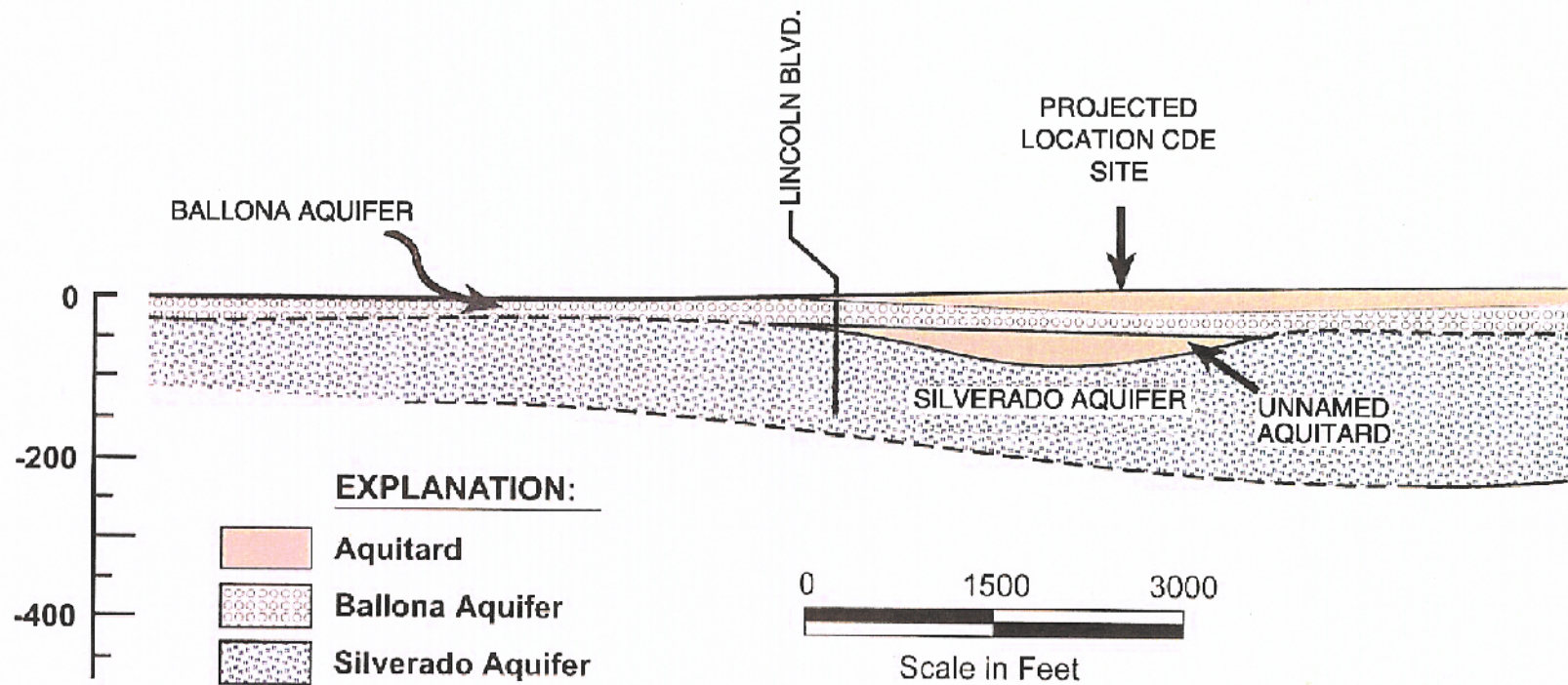
Source: URS, Groundwater Remedial Investigation Report, 2004a.

**FIGURE 2-4
PHYSIOGRAPHIC FEATURES,
GROUNDWATER BASINS,
AND SITE LOCATION
4144 GLENCOE AVENUE
LOS ANGELES, CALIFORNIA**

Date: June 2005

Project: HR0732

 **GeoSyntec Consultants**



SOURCE: URS, GROUNDWATER REMEDIAL INVESTIGATION REPORT, 2004a.

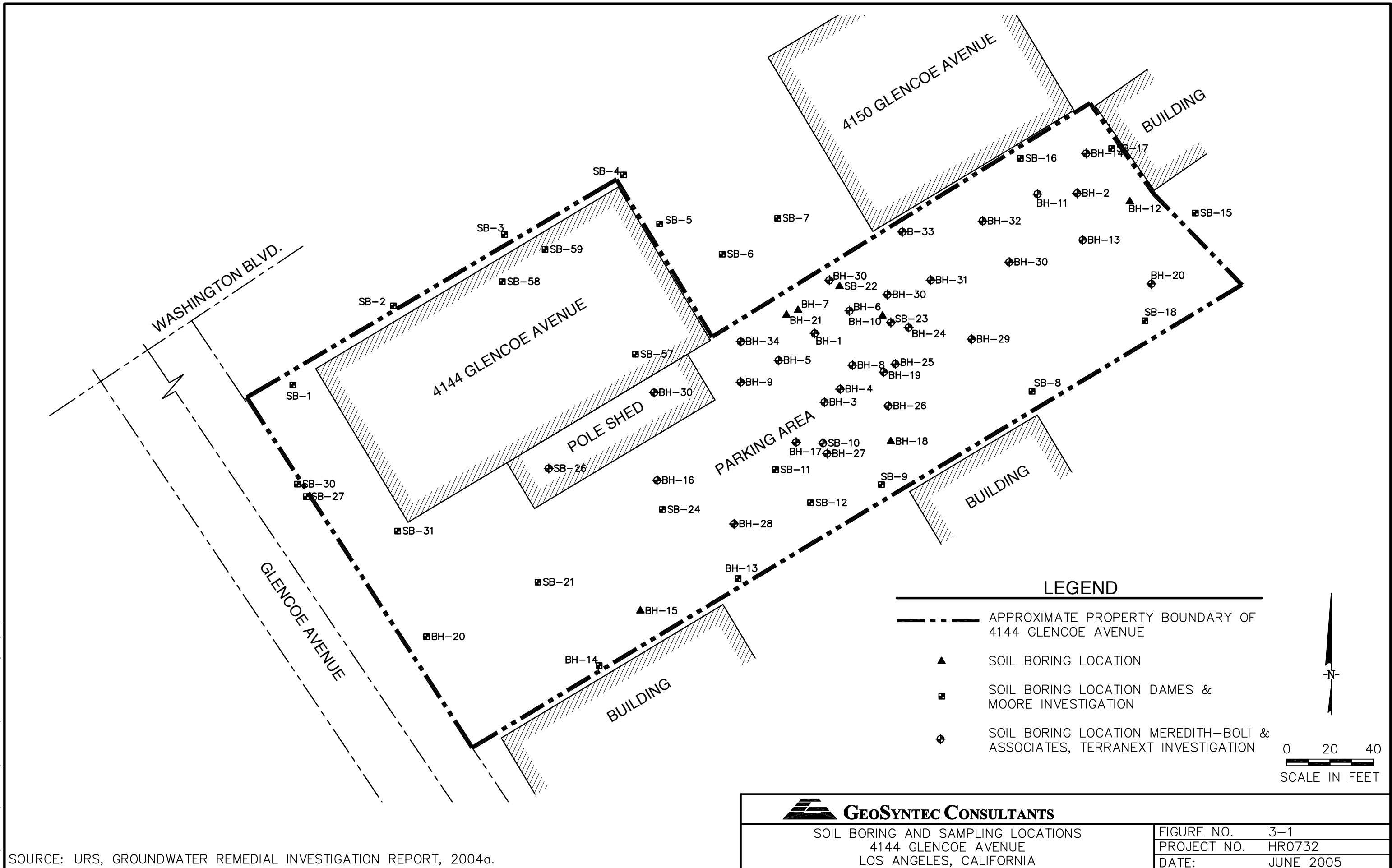


GEOSYNTEC CONSULTANTS

REGIONAL HYDROSTRATIGRAPHIC CROSS-SECTION
4144 GLENCOE AVENUE
LOS ANGELES, CALIFORNIA

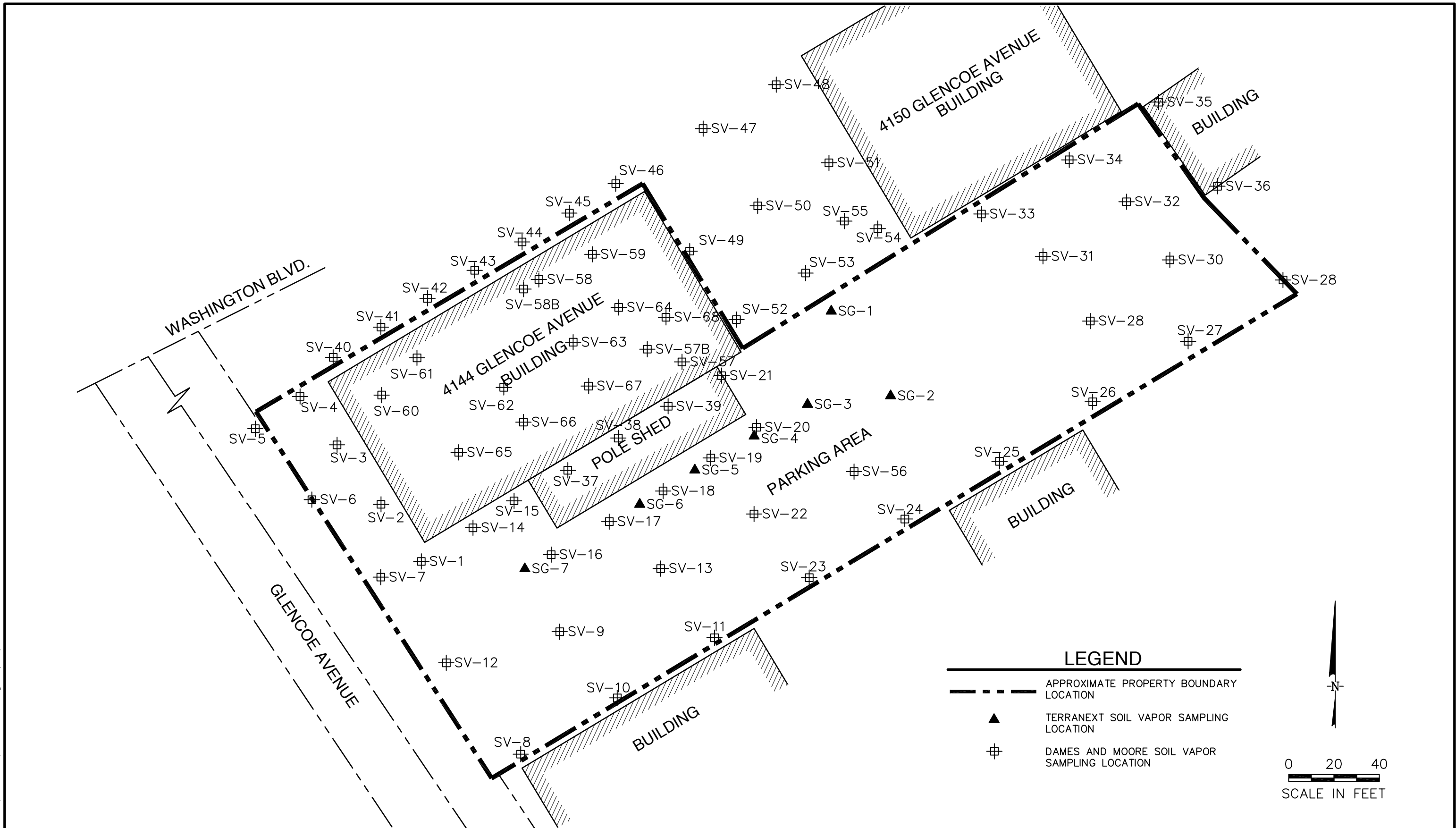
FIGURE NO.	2-5
PROJECT NO.	HR0732
DATE:	JUNE 2005

N: \CADD\HR0732\FIGURES\0732F035.dwg 7/01/05 09:09 VChew




SOURCE: URS, GROUNDWATER REMEDIAL INVESTIGATION REPORT, 2004a.

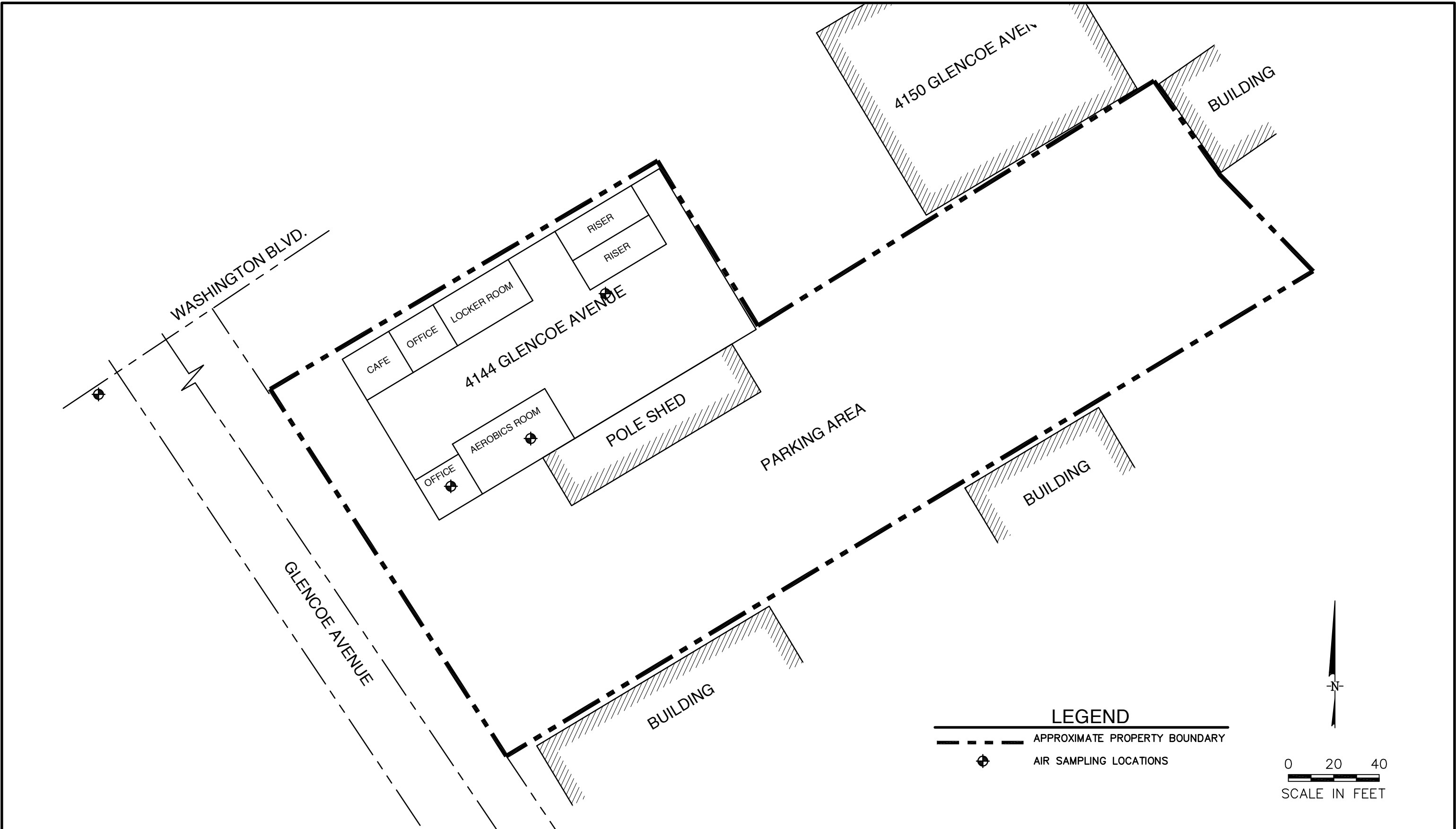
N: \CADD\HR0732\FIGURES\0732F005.dwg 7/01/05 09:10 VChew



SOURCE: URS, GROUNDWATER REMEDIAL INVESTIGATION REPORT, 2004a.

	
SOIL VAPOR SAMPLING LOCATIONS 4144 GLENCOE AVENUE LOS ANGELES, CALIFORNIA	
FIGURE NO.	3-2
PROJECT NO.	HR0732
DATE:	JUNE 2005

N:\CADD\HR0732\FIGURES\0732F007.dwg 7/01/05 09:11 VChew



SOURCE: URS, GROUNDWATER REMEDIAL INVESTIGATION REPORT, 2004a.



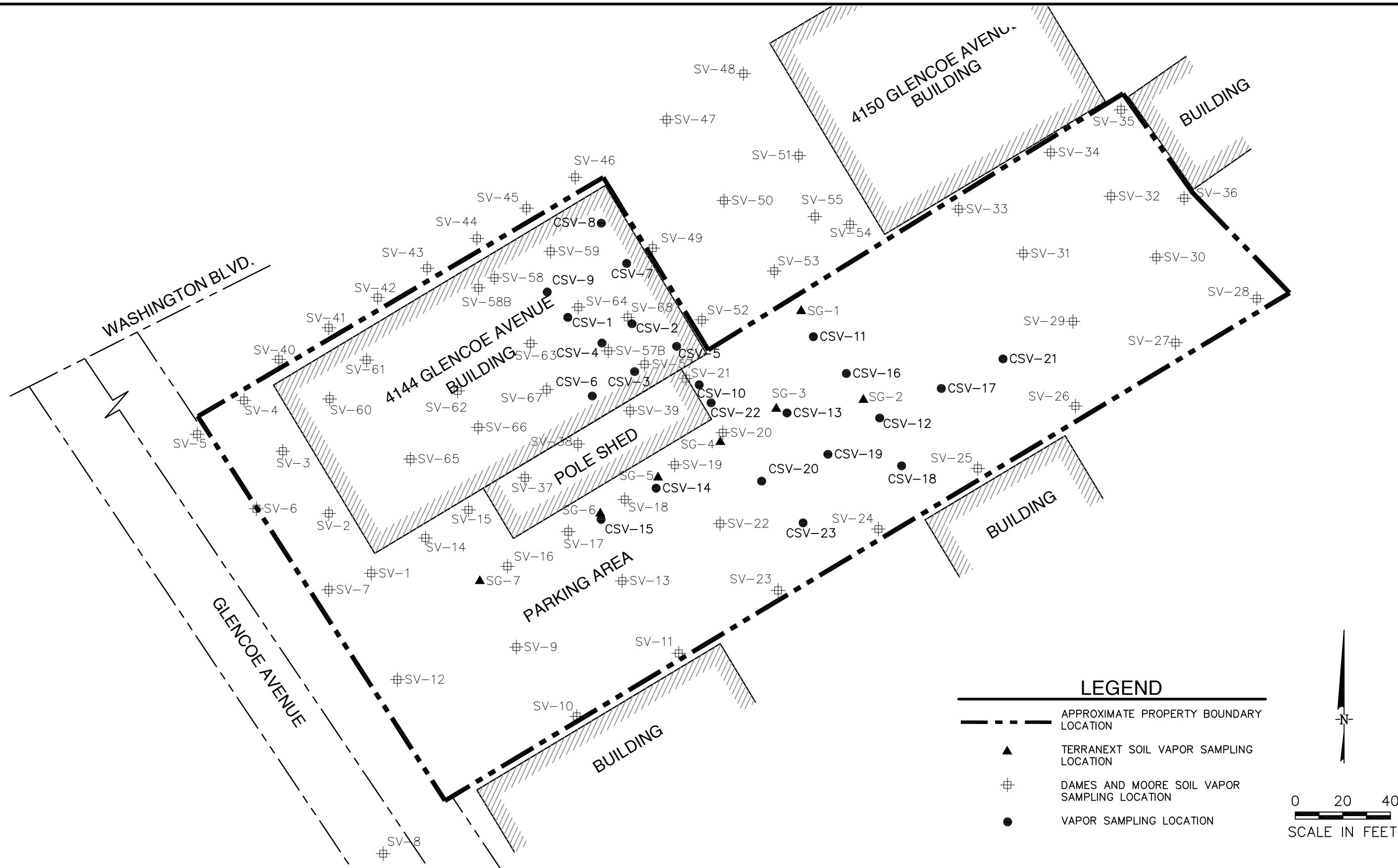
GEOSYNTEC CONSULTANTS

INDOOR AIR SAMPLING LOCATIONS
4144 GLENCOE AVENUE
LOS ANGELES, CALIFORNIA

FIGURE NO.	3-3
PROJECT NO.	HR0732
DATE:	JUNE 2005

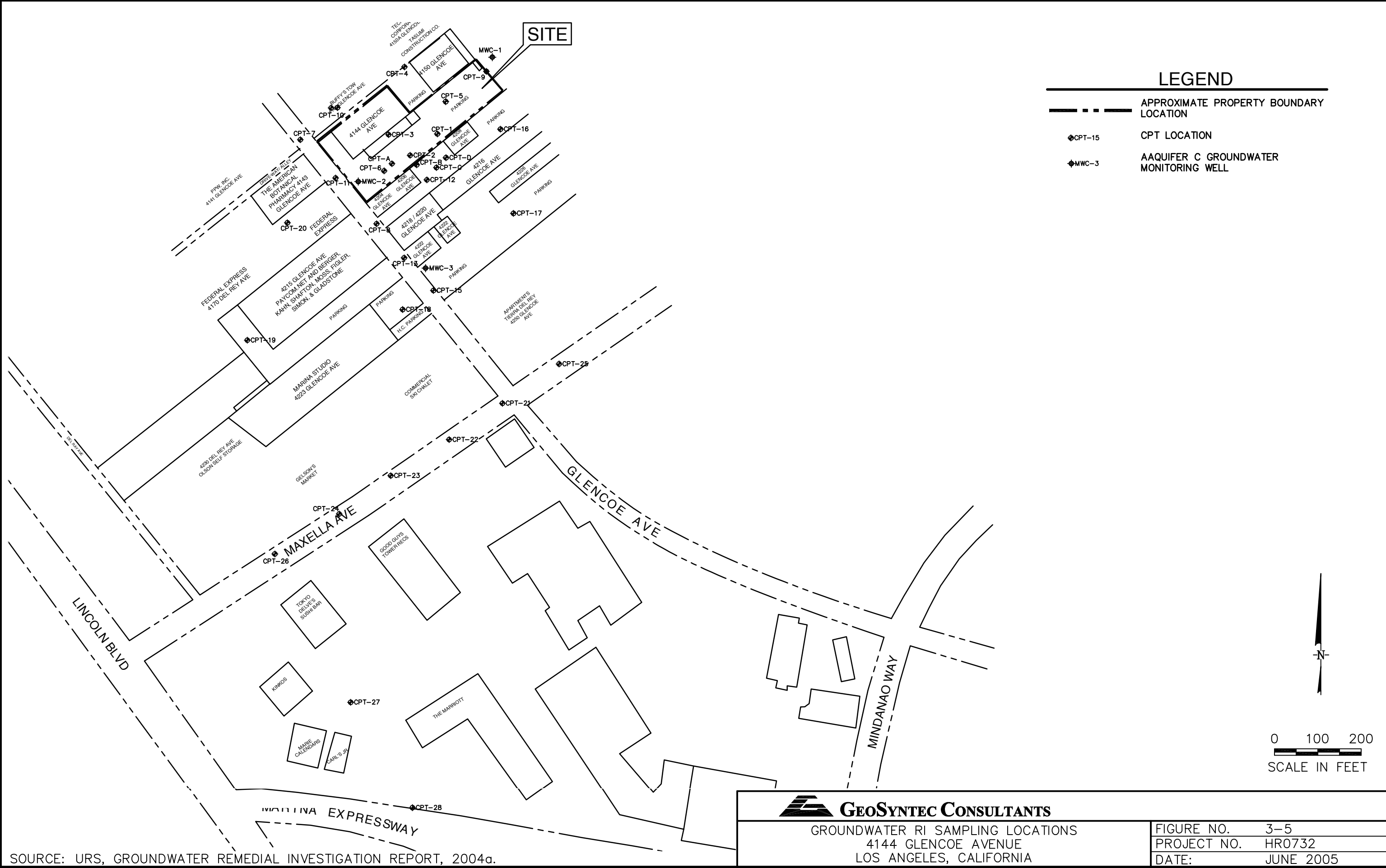
N: \\CACADD\HR0732\FIGURES\0732F041.dwg 7/01/05 13:21 VChew

SOURCE: URS, GROUNDWATER REMEDIAL INVESTIGATION REPORT, 2004a.





PRE-REMEDIAL DESIGN SOIL VAPOR SAMPLING LOCATIONS 4144 GLENCOE AVENUE VENICE, CALIFORNIA	FIGURE NO.	3-4
	PROJECT NO.	HR0732
	DATE:	JUNE 2005

N:\CADD\HR0732\FIGURES\0732F012.dwg 7/01/05 09:12 VChew

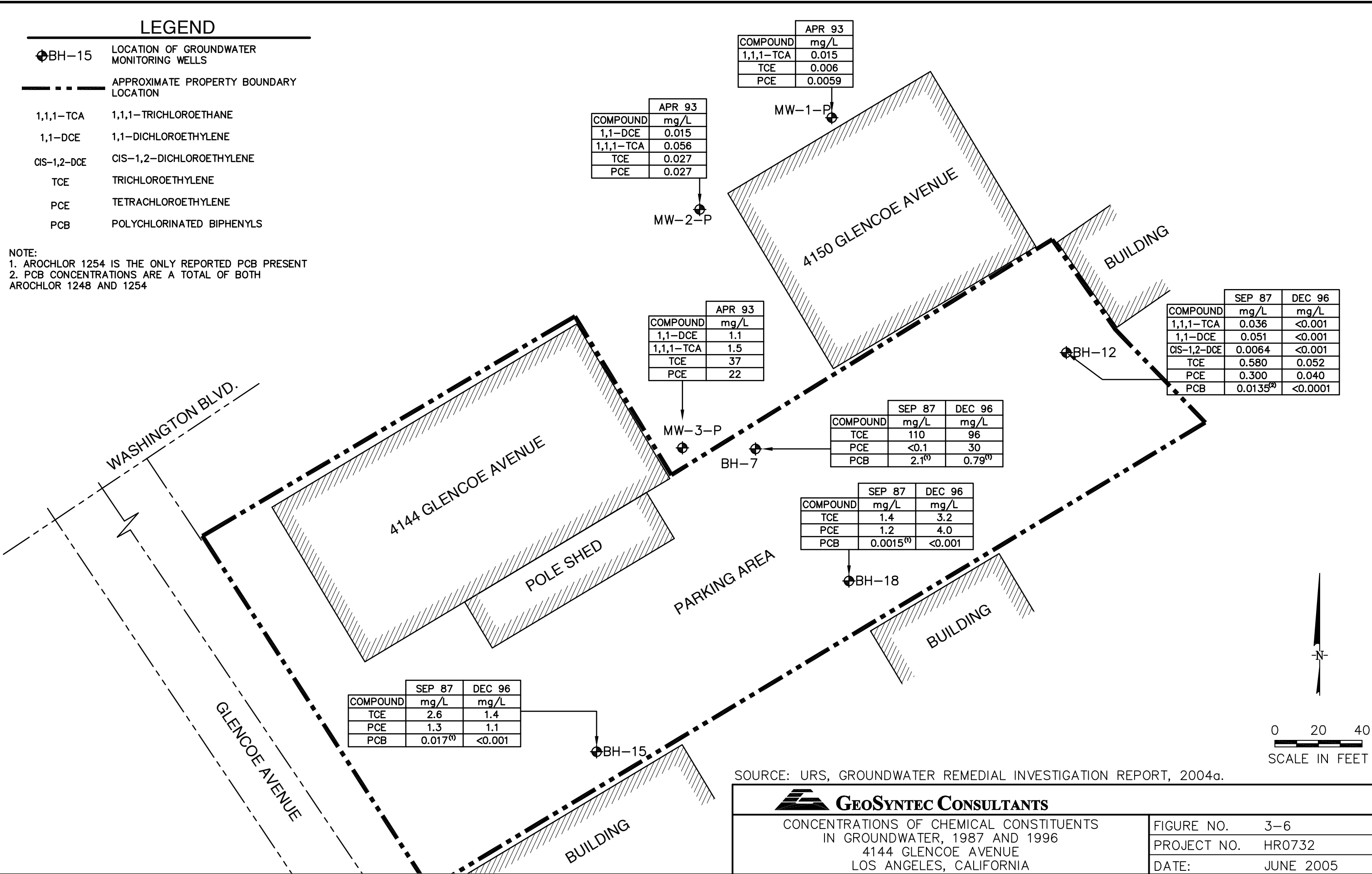


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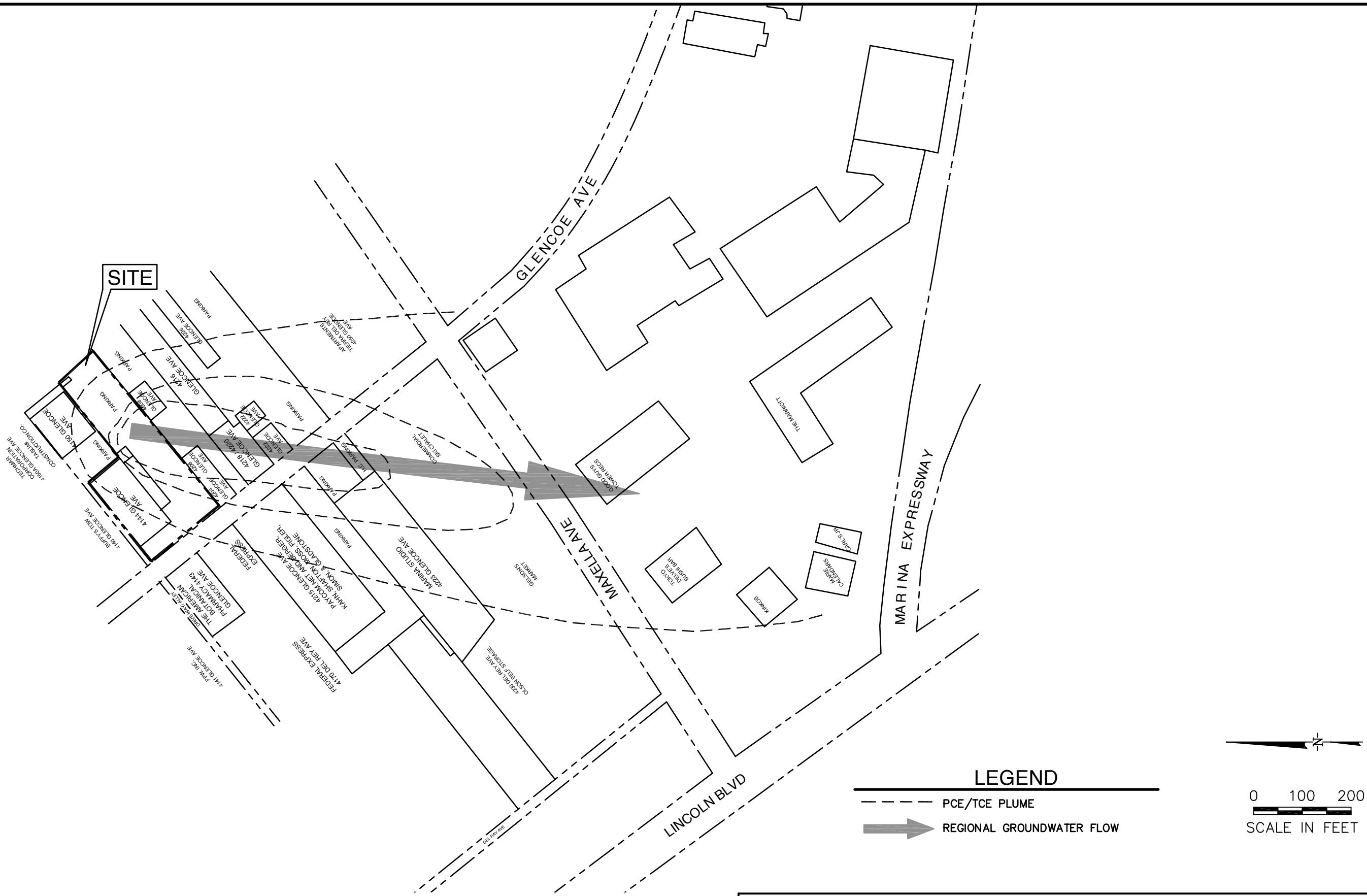
LEGEND

	BH-15	LOCATION OF GROUNDWATER MONITORING WELLS
		APPROXIMATE PROPERTY BOUNDARY LOCATION
1,1,1-TCA	1,1,1-TRICHLOROETHANE	
1,1-DCE	1,1-DICHLOROETHYLENE	
CIS-1,2-DCE	CIS-1,2-DICHLOROETHYLENE	
TCE	TRICHLOROETHYLENE	
PCE	TETRACHLOROETHYLENE	
PCB	POLYCHLORINATED BIPHENYLS	

NOTE:
1. AROCHLOR 1254 IS THE ONLY REPORTED PCB PRESENT
2. PCB CONCENTRATIONS ARE A TOTAL OF BOTH AROCHLOR 1248 AND 1254



SOURCE: URS, GROUNDWATER REMEDIAL INVESTIGATION REPORT, 2004a.

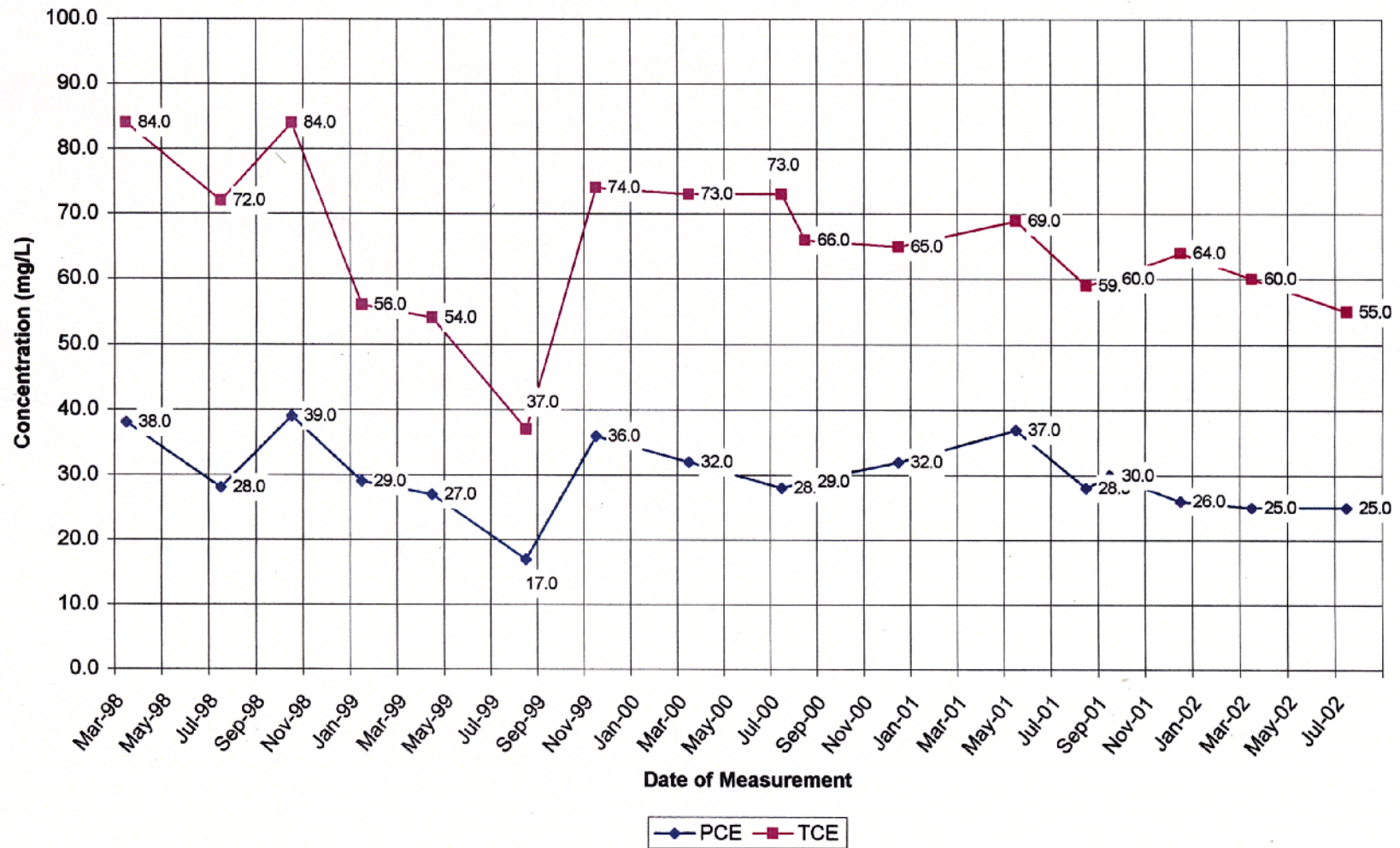


GEO SYNTEC CONSULTANTS

ESTIMATED EXTENT OF GROUNDWATER PLUME
4144 GLENCOE AVENUE
LOS ANGELES, CALIFORNIA

FIGURE NO.	3-7
PROJECT NO.	HR0732
DATE:	JUNE 2005

WELL BH-7 PCE / TCE CONCENTRATIONS IN mg/L



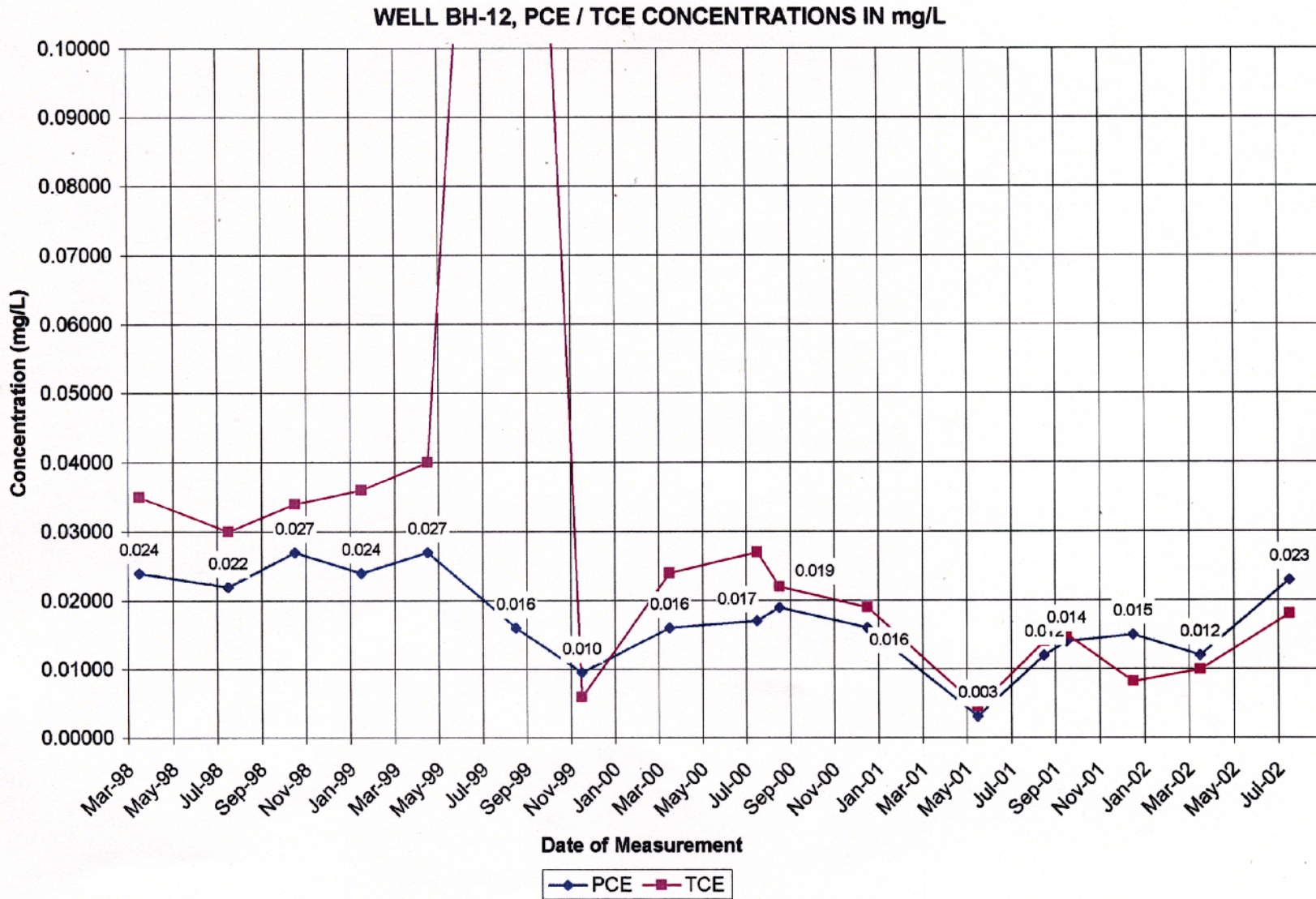
SOURCE: URS, GROUNDWATER REMEDIAL INVESTIGATION REPORT, 2004d.



GEOSYNTEC CONSULTANTS

TIME SERIES DATA FOR PCE/TCE CONCENTRATIONS IN BH-7
4144 GLENCOE AVENUE
LOS ANGELES, CALIFORNIA

FIGURE NO.	3-8
PROJECT NO.	HR0732
DATE:	JUNE 2005



SOURCE: URS, GROUNDWATER REMEDIAL INVESTIGATION REPORT, 2004a.

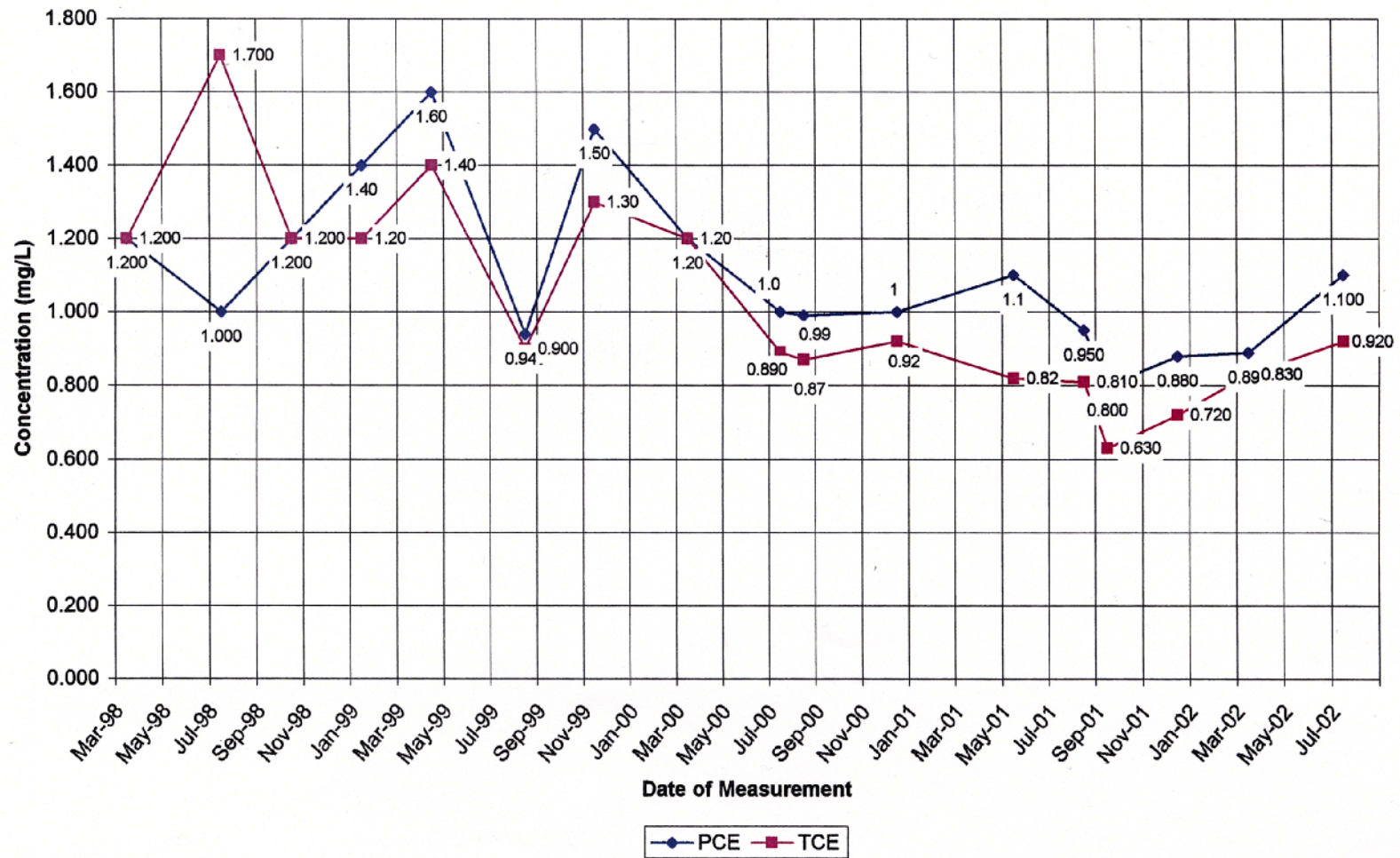


GEOSYNTEC CONSULTANTS

TIME SERIES DATA FOR PCE/TCE CONCENTRATIONS IN BH-12
4144 GLENCOE AVENUE
LOS ANGELES, CALIFORNIA

FIGURE NO.	3-9
PROJECT NO.	HR0732
DATE:	JUNE 2005

WELL BH-15 PCE/TCE CONCENTRATIONS IN mg/L



SOURCE: URS, GROUNDWATER REMEDIAL INVESTIGATION REPORT, 2004a.

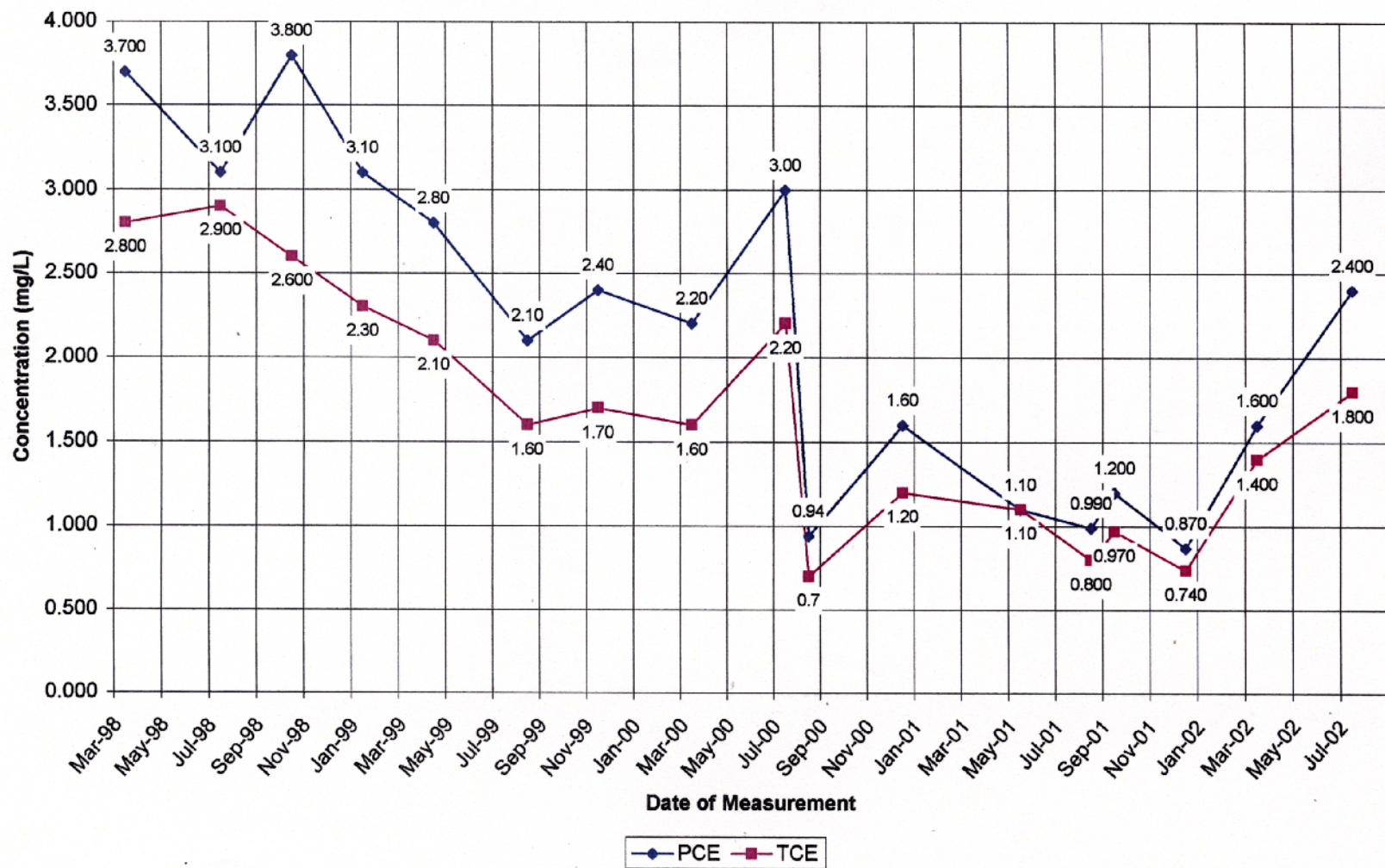


GEOSYNTEC CONSULTANTS

TIME SERIES DATA FOR PCE/TCE CONCENTRATIONS IN BH-15
4144 GLENCOE AVENUE
LOS ANGELES, CALIFORNIA

FIGURE NO.	3-10
PROJECT NO.	HR0732
DATE:	JUNE 2005

WELL BH-18 PCE / TCE CONCENTRATIONS IN mg/L



SOURCE: URS, GROUNDWATER REMEDIAL INVESTIGATION REPORT, 2004d.

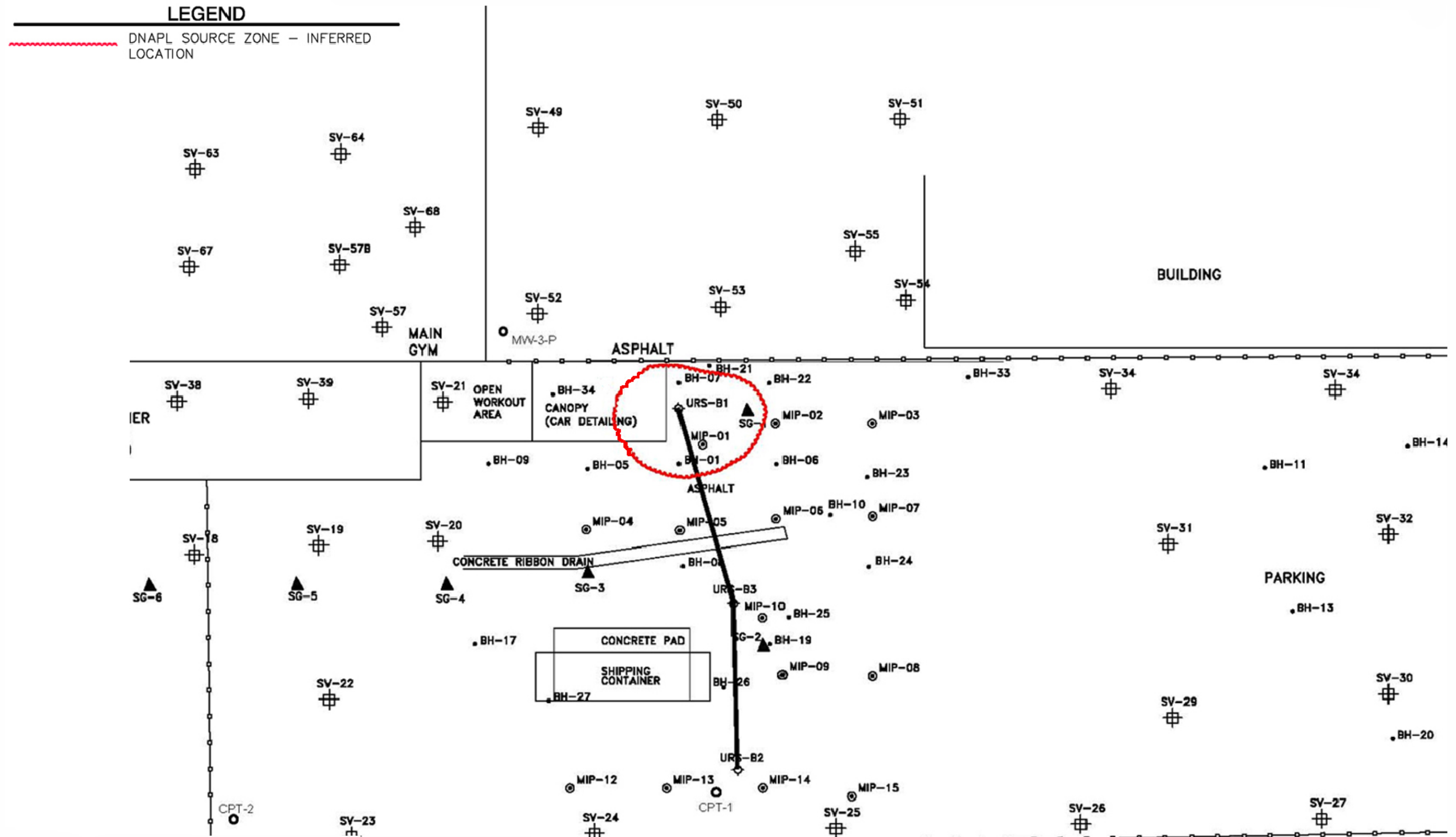


GEOSYNTEC CONSULTANTS

TIME SERIES DATA FOR PCE/TCE CONCENTRATIONS IN BH-18
4144 GLENCOE AVENUE
LOS ANGELES, CALIFORNIA

FIGURE NO.	3-11
PROJECT NO.	HR0732
DATE:	JUNE 2005

N:\CADCADD\HR0732\FIGURES\0732F034.dwg 7/01/05 09:27 VChew



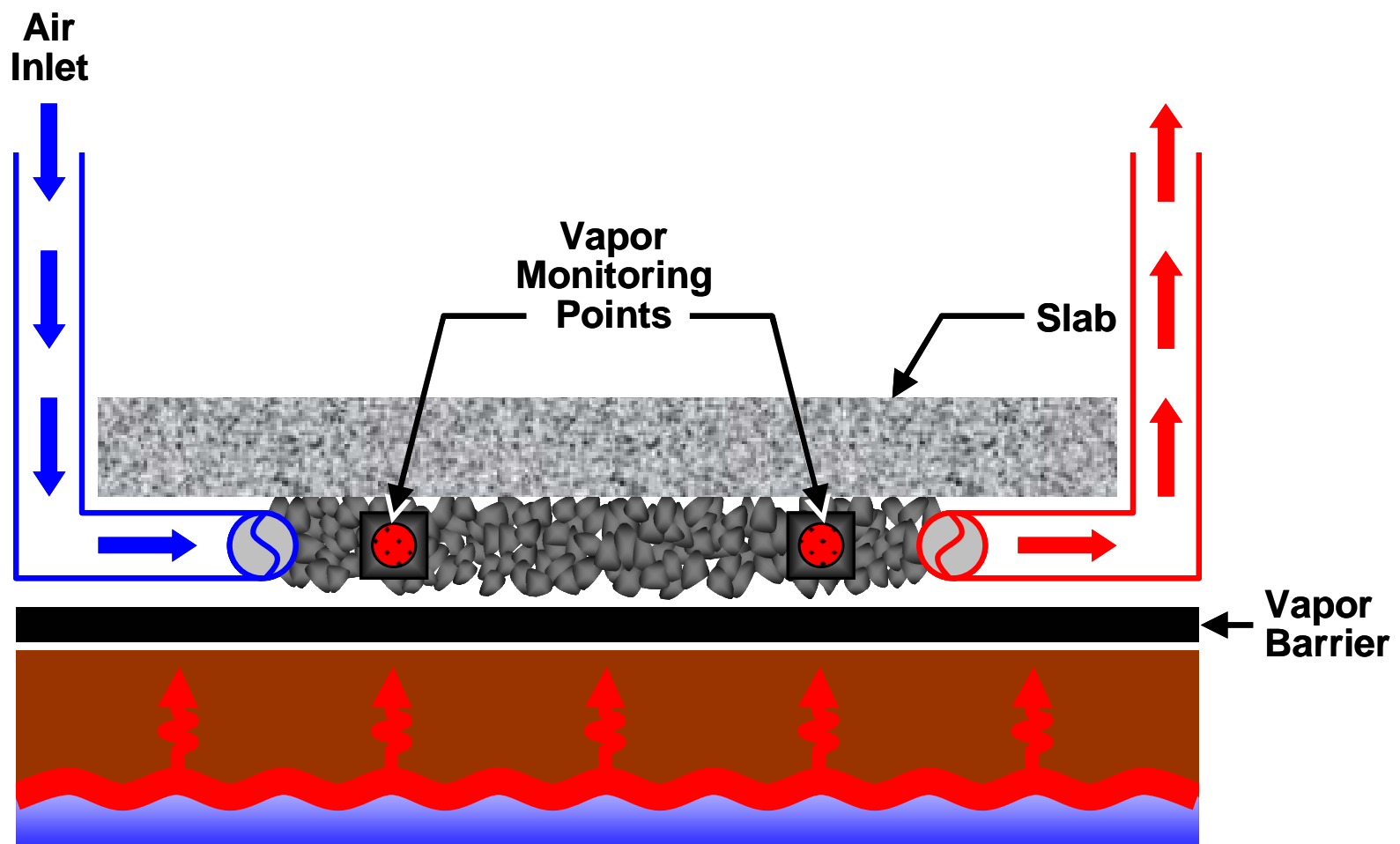
SOURCE: URS, GROUNDWATER REMEDIAL INVESTIGATION REPORT, 2004a.



GEOSYNTEC CONSULTANTS

ESTIMATED DELINEATION OF DNAPL SOURCE AREA
4144 GLENCOE AVENUE
VENICE, CALIFORNIA

FIGURE NO.	3-12
PROJECT NO.	HR0732
DATE:	JUNE 2005



GEOSYNTEC CONSULTANTS

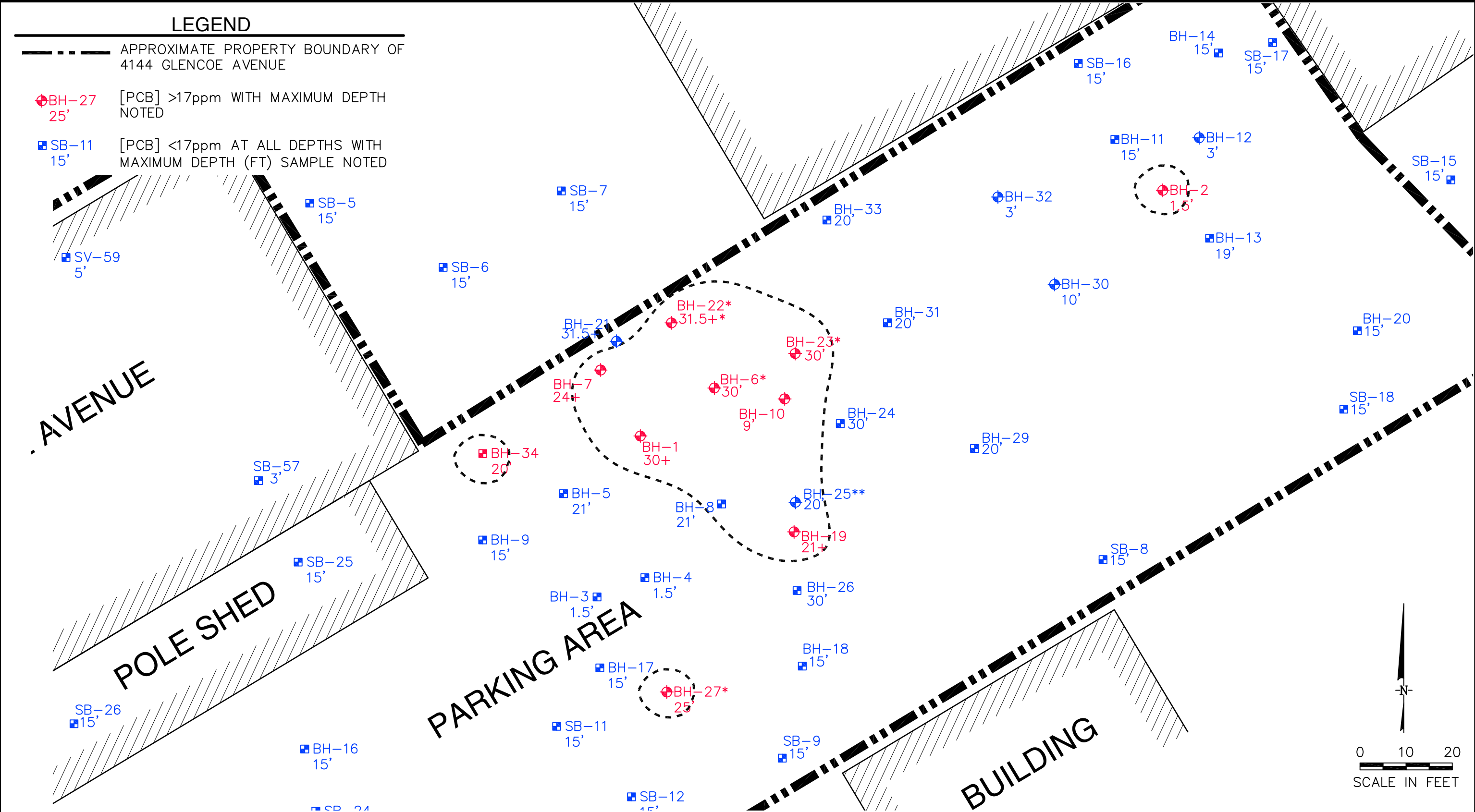
VAPOR CONTROL SYSTEM
TYPICAL CONSTRUCTION
4144 GLENCOE AVENUE SITE
VENICE, CALIFORNIA

FIGURE NO.: 6-1

PROJECT NO.: HR0732

DATE: JUNE 2005

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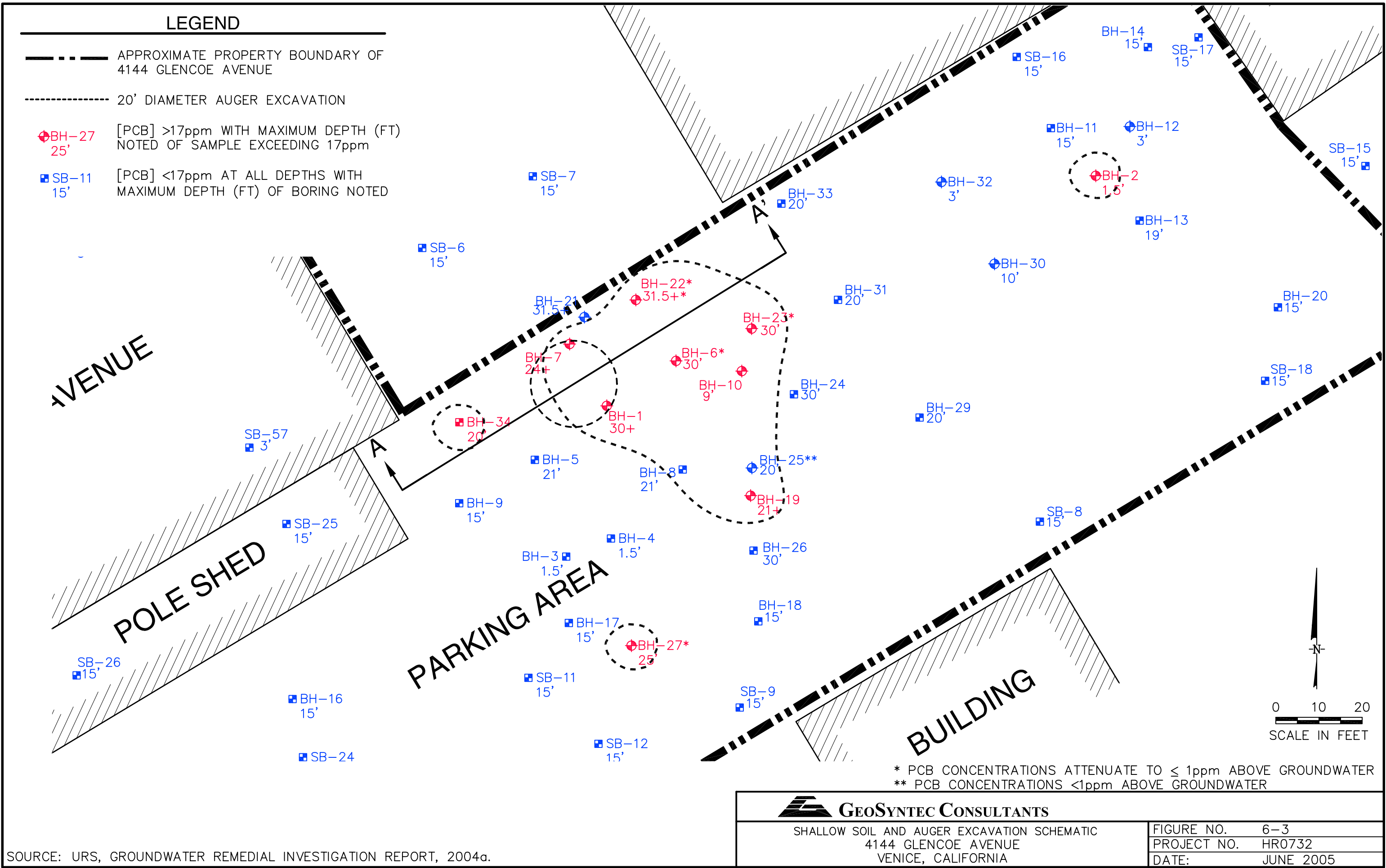


* PCB CONCENTRATIONS ATTENUATE TO ≤ 1 ppm ABOVE GROUNDWATER
** PCB CONCENTRATIONS <1ppm ABOVE GROUNDWATER

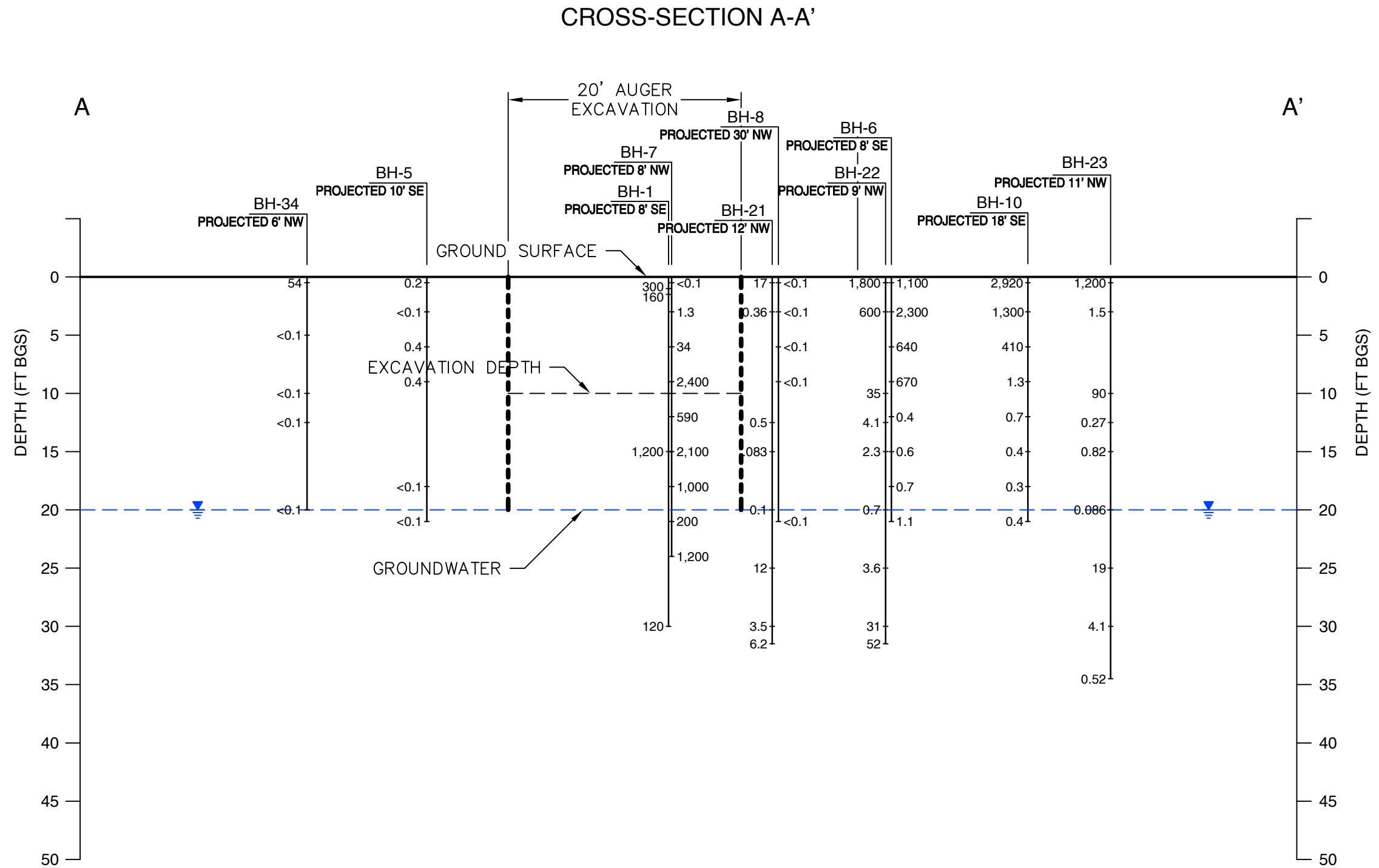
SOURCE: URS, GROUNDWATER REMEDIAL INVESTIGATION REPORT, 2004a.

 GeoSYNTEC CONSULTANTS	
PROPOSED AREA OF SHALLOW SOIL EXCAVATION 4144 GLENCOE AVENUE VENICE, CALIFORNIA	
FIGURE NO.	6-2
PROJECT NO.	HR0732
DATE:	JUNE 2005

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N:\CADD\HR0732\FIGURES\0732F046.dwg 7/01/05 09:39 VChew

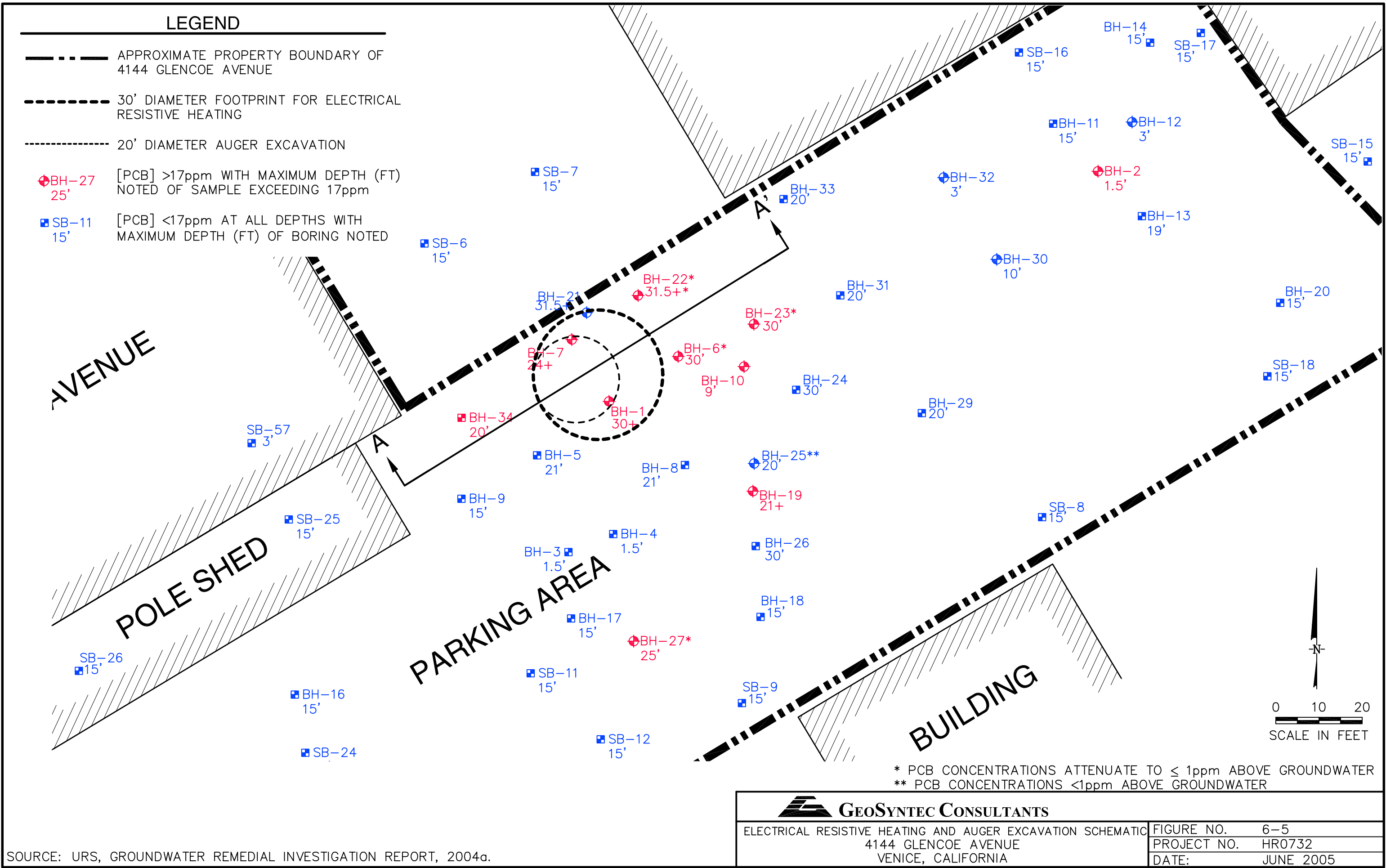


NOTES:

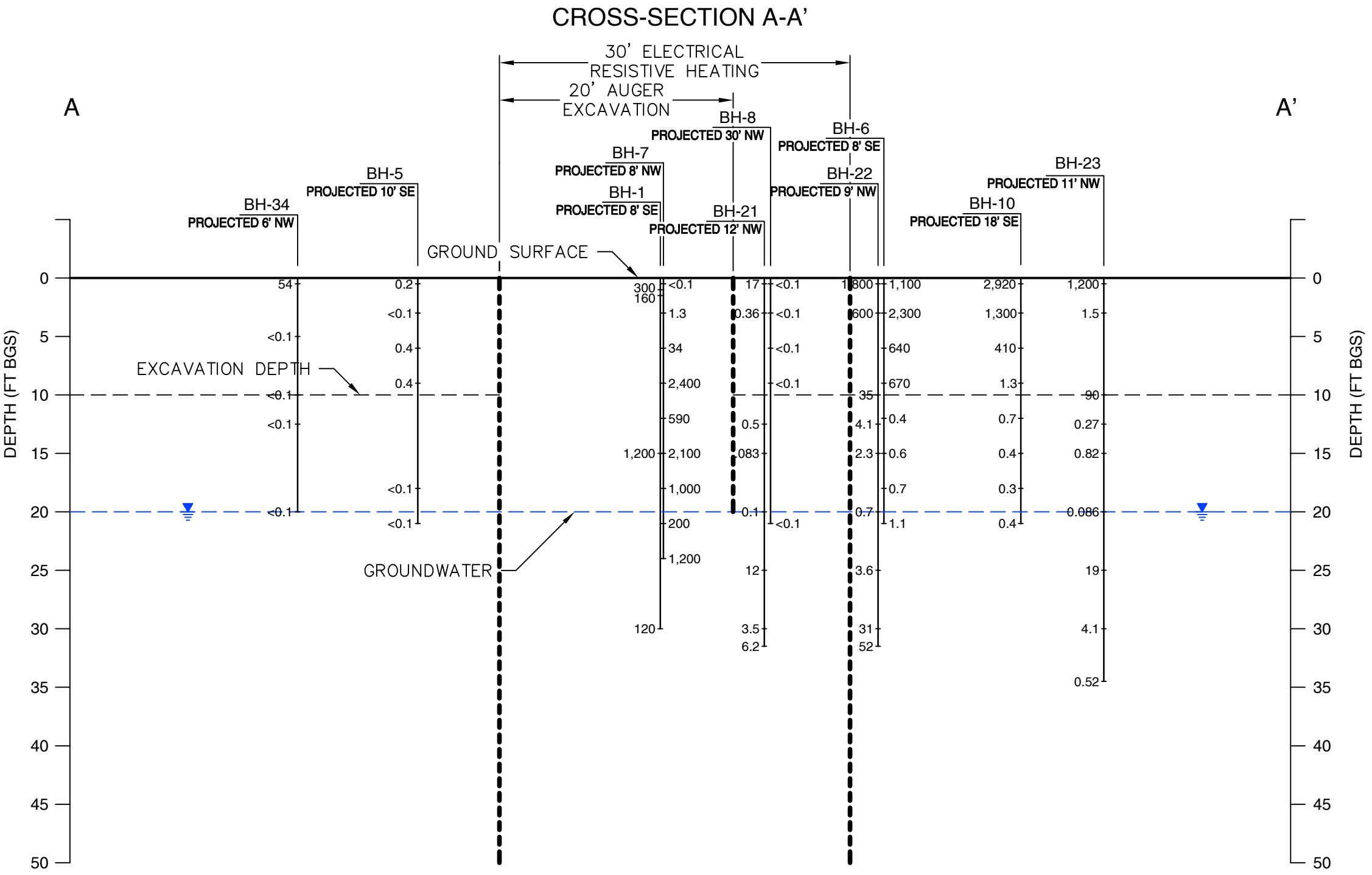
1. ALL CONCENTRATIONS ARE IN mg/kg
2. FT BGS = FEET BELOW GROUND SURFACE
3. THE EXCAVATION DEPTH INDICATES THE MAXIMUM DEPTH OF EXCAVATION (OUTSIDE OF AUGER EXCAVATION AREA) OF PCB SOIL CONCENTRATIONS EXCEEDING 17 mg/kg.

 GEOSYNTEC CONSULTANTS		
CROSS-SECTION A-A' PCB SOIL CONCENTRATIONS 4144 GLENCOE AVENUE LOS ANGELES, CALIFORNIA	FIGURE NO.	6-4
	PROJECT NO.	HR0732
	DATE:	JUNE 2005

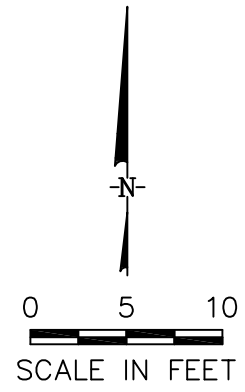
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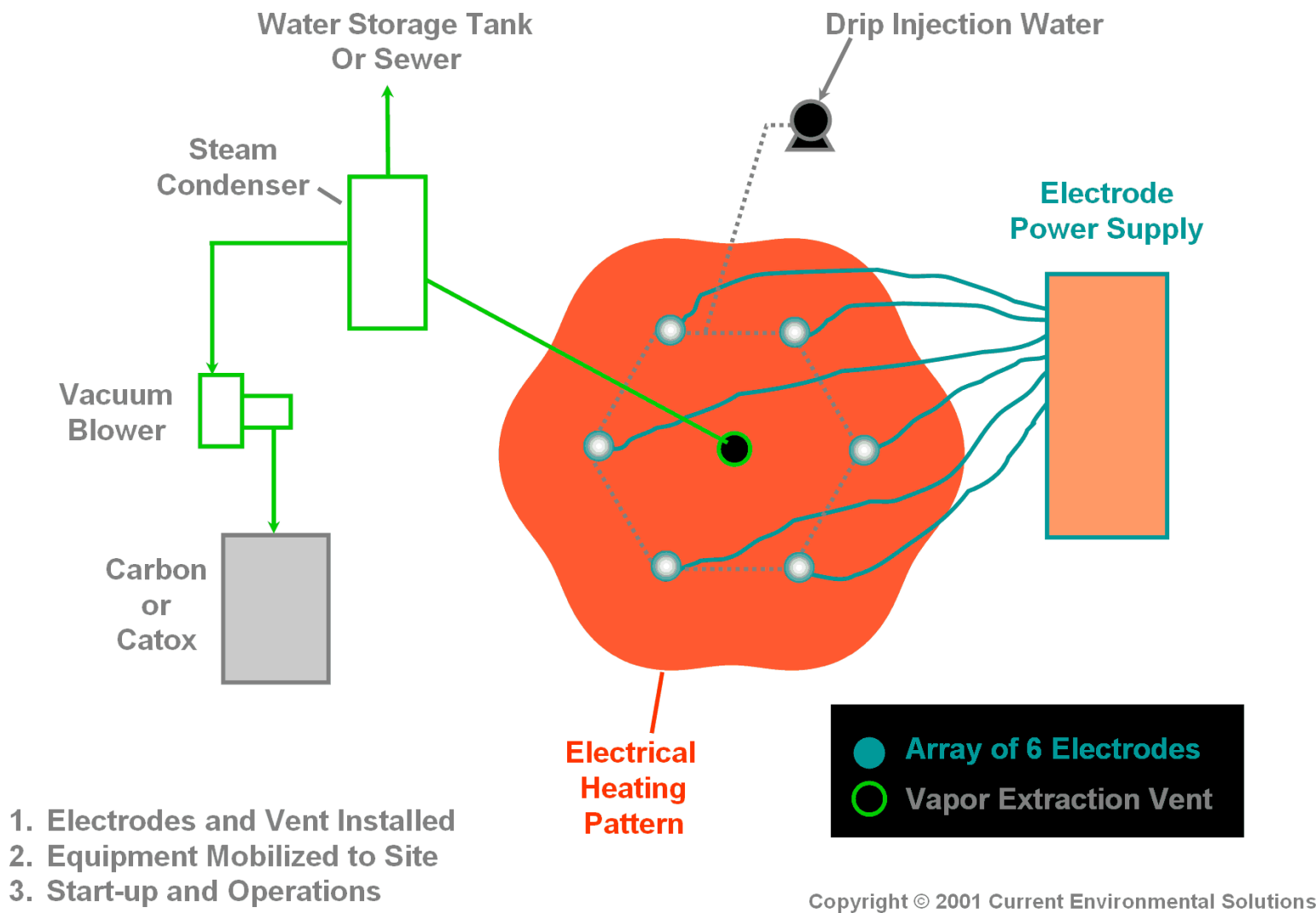
N:\CADD\HR0732\FIGURES\0732F045.dwg 7/01/05 09:41 VChew



- NOTES:
- 1. ALL CONCENTRATIONS ARE IN mg/kg
 - 2. FT BGS = FEET BELOW GROUND SURFACE
 - 3. THE EXCAVATION DEPTH INDICATES THE MAXIMUM DEPTH OF EXCAVATION (OUTSIDE OF AUGER EXCAVATION AREA) OF PCB SOIL CONCENTRATIONS EXCEEDING 17 mg/kg.



 GEOSYNTEC CONSULTANTS			
		CROSS-SECTION A-A' ELECTRICAL RESISTIVE HEATING AND AUGER EXCAVATION PROFILE 4144 GLENCOE AVENUE LOS ANGELES, CALIFORNIA	
FIGURE NO.	6-6	PROJECT NO.	HR0732
DATE:	JUNE 2005		



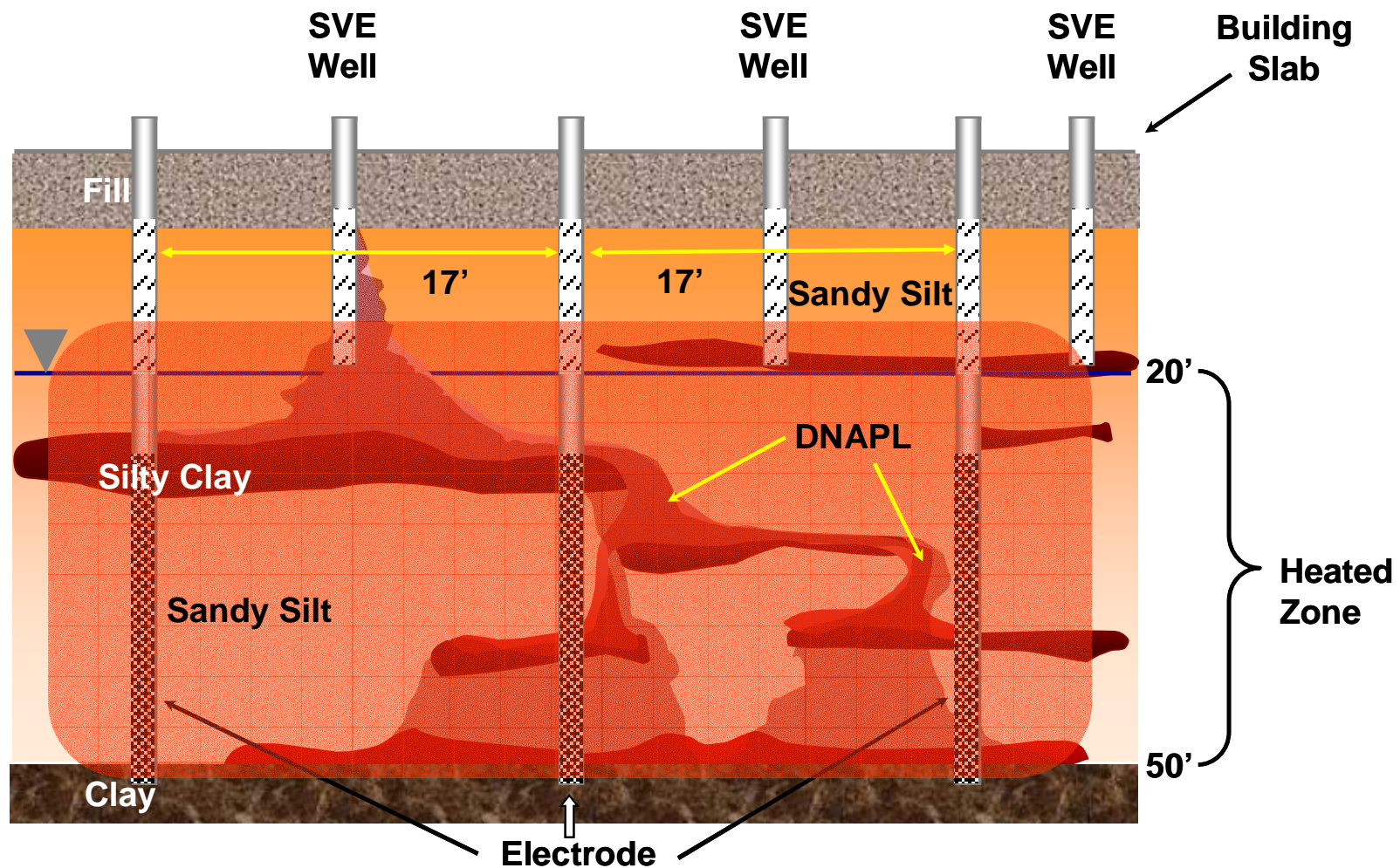
GEOSYNTEC CONSULTANTS

GENERAL PLAN VIEW SCHEMATIC FOR
ELECTRICAL RESISTIVE HEATING
4144 GLENCOE AVENUE SITE
VENICE, CALIFORNIA

FIGURE NO.: 6-7

PROJECT NO.: HR0732

DATE: JUNE 2005



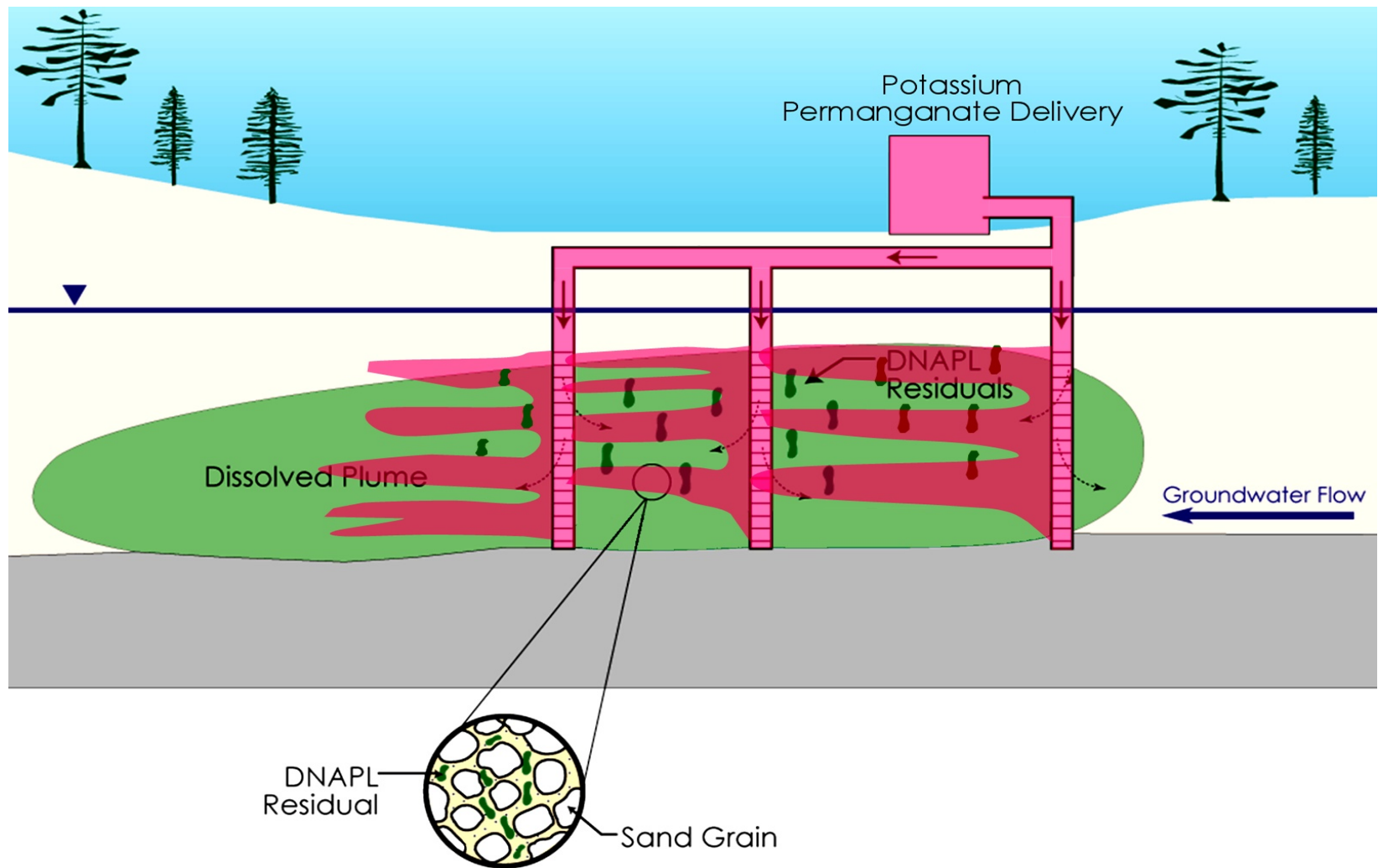
GEOSYNTEC CONSULTANTS

GENERAL CROSS-SECTION SCHEMATIC FOR
ELECTRICAL RESISTIVE HEATING
4144 GLENCOE AVENUE SITE
VENICE, CALIFORNIA

FIGURE NO.: 6-8

PROJECT NO.: HR0732

DATE: JUNE 2005



GEOSYNTEC CONSULTANTS

GENERAL CROSS-SECTION SCHEMATIC FOR
IN-SITU CHEMICAL OXIDATION
4144 GLENCOE AVENUE SITE
VENICE, CALIFORNIA

FIGURE NO.: 6-9

PROJECT NO.: HR0732

DATE: JUNE 2005

APPENDIX A

SOURCE ZONE ASSESSMENT DATA

ANALYTICAL RESULTS
SOIL AND GROUNDWATER SAMPLES
AUGUST 2004
FORMER CORNELL - DUBILIER ELECTRONICS, INC. FACILITY
LOS ANGELES, CALIFORNIA

VOCs																				PCBs	
Location	Depth (feet)	Matrix	Benzene (mg/kg)	Chloroform (mg/kg)	1,2-DCB (mg/kg)	c-1,2-DCE (mg/kg)	Styrene (mg/kg)	1,1,1,2-TCA (mg/kg)	1,1,2,2-TCA (mg/kg)	PCE (mg/kg)	TCE (mg/kg)	1,1,1-TCA (mg/kg)	1,2,3-TCB (mg/kg)	1,2,4-TCB (mg/kg)	1,2,3-TCP (mg/kg)	Vinyl Chloride (mg/kg)	p/m-xylenes (mg/kg)	o-xylenes (mg/kg)	Toluene (mg/kg)	Aroclor 1248 (mg/kg)	Aroclor 1254 (mg/kg)
URS-1	6	Soil	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	0.11	ND (< 0.005)	0.0054	0.0075	69	8	ND (< 0.005)	17	0.082	0.0096	ND (< 0.005)	0.005	ND (< 0.005)	0.063	ND<50	500
URS-1	14.5	Soil	ND (< 0.005)	0.0083	ND (< 0.005)	0.076	ND (< 0.005)	0.0024	0.0023	53	1.3	ND (< 0.005)	2.2	0.69	0.038	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	NA	NA
URS-1	17.5	Soil	ND (< 0.005)	ND(<0.630)	ND(<0.630)	ND(<0.630)	ND(<0.630)	ND(<0.630)	ND(<0.630)	250	8.4	ND(<0.630)	3.7	16	ND(<0.630)	ND(<0.630)	ND(<0.630)	ND(<0.630)	ND(<0.630)	ND<50	98
URS-1	19	Soil	ND (< 0.005)	ND(<0.500)	ND(<0.500)	ND(<0.500)	ND(<0.500)	2.3	ND(<0.500)	5,100	250	ND(<0.500)	16	68	ND(<0.500)	ND(<0.500)	1.7	2.9	3.7	NA	NA
URS-1	20.5	Soil	ND (< 0.005)	ND(<0.630)	ND(<0.630)	ND(<0.630)	ND(<0.630)	0.7	ND(<0.630)	1,600	170	ND(<0.630)	7.7	32	ND(<0.630)	ND(<0.630)	ND(<0.630)	0.730	ND(<0.630)	ND<50	300
URS-1	22	Soil	ND (< 0.005)	0.67	0.68	0.76	ND(<0.630)	2.7	ND(<0.630)	6,700	4300	1,200	37	130	ND(<0.630)	ND(<0.630)	2.2	4.7	160	NA	NA
URS-1	23.3	Soil	ND(< 0.630)	ND(<0.630)	0.77	ND(<0.630)	4.7	0.92	ND(<0.630)	2,600	2500	0.710	64	220	ND(<0.630)	ND(<0.630)	2.2	1.9	190	ND<50	3,500
URS-1	28	Soil	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	0.17	0.21	ND (< 0.005)	ND (< 0.005)	0.021	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	0.011	ND<0.5	3.8
URS-1	29.5	Soil	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	0.059	0.042	ND (< 0.005)	ND (< 0.005)	0.0077	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND<0.05	0.74
URS-1	35.5	Soil	ND (< 0.130)	ND (< 0.130)	ND (< 0.130)	ND (< 0.130)	ND (< 0.130)	ND (< 0.130)	ND (< 0.130)	8.6	5.3	ND (< 0.130)	0.31	0.85	ND (< 0.130)	ND (< 0.130)	ND (< 0.130)	ND (< 0.130)	ND (< 0.130)	NA	NA
URS-1	40	Soil	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	0.37	0.3	ND (< 0.005)	0.012	0.036	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	0.015	NA	NA
URS-1	43	Soil	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	0.043	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	0.12	0.29	ND (< 0.005)	ND (< 0.005)	0.007	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND<0.05	0.16
URS-1	49	Soil	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	0.0057	ND (< 0.005)	ND (< 0.005)	1.8	0.73	ND (< 0.005)	0.54	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	0.0067	ND (< 0.005)	0.034	NA	NA
URS-1	53.5	Soil	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	0.0091	ND (< 0.005)	ND (< 0.005)	0.24	0.14	ND (< 0.005)	0.28	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	0.0065	0.0052	0.13	NA	NA
URS-1	54	Water	ND (< 0.100)	ND (< 0.200)	ND (< 0.200)	ND (< 0.200)	ND (< 0.200)	ND (< 0.200)	ND (< 0.200)	1.70	1.0	ND (< 0.200)	ND (< 0.200)	0.49	ND (< 0.200)	ND (< 0.200)	ND (< 0.200)	ND (< 0.200)	0.7	NA	NA
URS-1	57	Water	ND (< 0.100)	ND (< 0.200)	ND (< 0.200)	ND (< 0.200)	ND (< 0.200)	ND (< 0.200)	ND (< 0.200)	1.33	0.38	ND (< 0.200)	ND (< 0.200)	0.48	ND (< 0.200)	ND (< 0.200)	ND (< 0.200)	ND (< 0.200)	1.3	NA	NA
URS-2	14.5	Soil	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	0.54	0.29	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	0.7	ND<0.05
URS-2	26	Soil	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	0.043	0.023	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND<0.05	0.42
URS-2	28	Soil	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND<0.05	ND<0.05
URS-2	29.5	Soil	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	NA	NA
URS-2	38	Soil	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	0.017	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	0.95	1.1	ND (< 0.005)	0.015	0.034	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND<0.05	ND<0.05
URS-2	48.5	Soil	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	0.034	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	0.46	5.0	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	0.0092	NA	NA
URS-2	45	Water	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	0.081	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	1.2	0.3	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	NA	NA
URS-2	50	Water	ND (< 0.050)	ND (< 0.050)	ND (< 0.050)	0.073	ND (< 0.050)	ND (< 0.050)	ND (< 0.050)	1.1	1.1	ND (< 0.050)	ND (< 0.050)	ND (< 0.050)	ND (< 0.050)	ND (< 0.050)	ND (< 0.050)	ND (< 0.050)	ND (< 0.050)	NA	NA
URS-3	16	Soil	ND (< 0.005)	0.0069	ND (< 0.005)	0.15	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	0.49	0.9	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND<0.05	0.49
URS-3	19	Soil	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	0.027	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	0.25	0.13	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND<0.05	ND<0.05
URS-3	22	Soil	ND (< 0.005)	0.023	ND (< 0.005)	0.42	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	8.6	2.8	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	NA	NA
URS-3	28	Soil	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	0.047	0.023	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	NA	NA
URS-3	31	Soil	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	0.037	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	0.89	0.29	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	NA	NA
URS-3	37.5	Soil	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	0.42	0.081	ND (< 0.005)	0.031	0.067	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	NA	NA
URS-3	40.5	Soil	0.0063	ND (< 0.005)	ND (< 0.005)	0.7	0.018	ND (< 0.005)	ND (< 0.005)	9.5	20	ND (< 0.005)	0.04	0.1	ND (< 0.005)	ND (< 0.005)	0.017	0.0068	0.59	NA	NA
URS-3	45	Soil	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	0.013	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	0.025	0.17	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	NA	NA
URS-3	49.5	Soil	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	0.0084	0.012	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	NA	NA
URS-3	50.5	Water	ND (< 0.005)	ND (< 0.010)	ND (< 0.010)	0.052	ND (< 0.010)	ND (< 0.010)	ND (< 0.010)	0.96	1.0	ND (< 0.010)	ND (< 0.010)	ND (< 0.010)	ND (< 0.010)	ND (< 0.010)	ND (< 0.010)	ND (< 0.010)	ND (< 0.010)	NA	NA
URS-3	53	Water	ND (< 0.010)	ND (< 0.010)	ND (< 0.010)	0.034	ND (< 0.010)	ND (< 0.010)	ND (< 0.010)	1.3	0.03	ND (< 0.010)	ND (< 0.010)	ND (< 0.010)	ND (< 0.010)	ND (< 0.010)	ND (< 0.010)	ND (< 0.010)	ND (< 0.010)	NA	NA
URS-3	55	Water	ND (< 0.005)	ND (< 0.010)	ND (< 0.010)	0.027	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	0.67	0.03	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	ND (< 0.005)	NA	NA
URS-3	57	Water	ND (< 0.010)	ND (< 0.010)	ND (< 0.010)	0.011	ND (< 0.010)	ND (< 0.010)	ND (< 0.010)	0.14	0.03	ND (< 0.010)	ND (< 0.010)	ND (< 0.010)	ND (< 0.010)	ND (< 0.010)	ND (< 0.010)	ND (< 0.010)	ND (< 0.010)	NA	NA

Abbreviations:

ND = Not detected above indicated detection limit

NA = Sample not analyzed for this analyte

VOCs = Volatile Organic Compounds

CT = carbon tetrachloride

1,1-DCE = 1,1-dichloroethene

c-1,2-DCE = cis-1,2-dichloroethene

t-1,2-DCE = trans-1,2-dichloroethene

1,2-DCB = 1,2-dichlorobenzene

1,4-DCB = 1,4-dichlorobenzene

Groundwater samples indicated in blue and *italics*

PCE = tetrachloroethylene

1,1,1-TCA = 1,1,1-trichloroethane

1,1,2-TCA = 1,1,2-trichloroethane

TCE = trichloroethylene

1,2,3-TCB = 1,2,3-trichlorobenzene

1,2,4-TCB = 1,2,4-trichlorobenzene

1,2,3-TCP = 1,2,3-trichloropropane

t-1,3-DPE = trans-1,3-dichloropropene

**ANALYTICAL RESULTS
SOIL AND GROUNDWATER SAMPLES
AUGUST 2004
FORMER CORNELL - DUBILIER ELECTRONICS, INC. FACILITY
LOS ANGELES, CALIFORNIA**

VOCs					PCBs	
Location	Depth (feet)	Sudan Red Y/N	PCE (mg/kg)	TCE (mg/kg)	Aroclor 1248 (mg/kg)	Aroclor 1254 (mg/kg)
URS-1	6	NA	69	8	ND<50	500
URS-1	14.5	N	53	1.3	NA	NA
URS-1	17.5	N	250	8.4	ND<50	98
URS-1	19	Y	5,100	250	NA	NA
URS-1	20.5	Y	1,600	170	ND<50	300
URS-1	22	Y	6,700	4300	NA	NA
URS-1	23.3	Y	2,600	2500	ND<50	3,500
URS-1	25	Y	NA	NA	NA	NA
URS-1	28	Y	0.17	0.21	ND<0.5	3.8
URS-1	29.5	N	0.059	0.042	ND<0.05	0.74
URS-1	30.5	Y	NA	NA	NA	NA
URS-1	31	N	NA	NA	NA	NA
URS-1	35.5	NA	8.6	5.3	NA	NA
URS-1	38	N	NA	NA	NA	NA
URS-1	40	NA	0.37	0.3	NA	NA
URS-1	43	NA	0.12	0.29	ND<0.05	0.16
URS-1	49	NA	1.8	0.73	NA	NA
URS-1	53.5	NA	0.24	0.14	NA	NA
<i>URS-1</i>	<i>34</i>		<i>75</i>	<i>180</i>	<i>NA</i>	<i>NA</i>
<i>URS-1</i>	<i>47</i>		<i>33</i>	<i>38</i>	<i>NA</i>	<i>NA</i>

Groundwater samples shown in italics.

APPENDIX B

**FINAL LABORATORY MEASUREMENT OF NATURAL
OXIDANT DEMAND OF SOIL**

Prepared for:

GeoSyntec Consultants
2100 Main Street, Suite 150
Huntington Beach, CA
92648

FINAL

LABORATORY MEASUREMENT OF NATURAL OXIDANT DEMAND OF SOIL

**Cornell Dubilier Electronics
Venice, California**

Prepared by:



130 Research Lane, Suite 2
Guelph, Ontario N1G 5G3
SiREM Ref: WR-0690.02

12 May 2005

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Table 1:	Summary of Controls and Treatments
Table 2:	Summary of Oxidant Demand Results

LIST OF ABBREVIATIONS

g	grams
g/L	grams per liter
GeoSyntec	GeoSyntec Consultants International
kg	kilograms
mg	milligrams
mg/L	milligrams per liter
mL	milliliters
NaMnO ₄	sodium permanganate
nm	nanometer
SiREM	SiREM Laboratory
SLC	soil leach control
ST	soil treatment
µm	micron

1. INTRODUCTION

GeoSyntec Consultants International (GeoSyntec) retained SiREM Laboratories (SiREM) to perform a laboratory study to determine the natural oxidant demand of soils at the Cornell Dubilier Electronics site in Venice Beach, California (the Site). Soil cores collected from six locations were received from Calscience Environmental Laboratories on 13 September 2004.

The remainder of this report is divided into two sections. Section 2 presents the experimental approach and methods and Section 3 presents the results of the natural oxidant demand measurements.

2. APPROACH AND METHODS

The following sections summarize the approach and methods for reactor construction and incubation (Section 2.1), and reactor sampling and analysis (Section 2.2).

2.1 Reactor Construction

The soil material collected for each location was individually homogenized to improve reproducibility between replicates and to ensure that the triplicate treatment reactors contained similar starting soil materials.

All soil batch reactors were constructed on 16 September 2004. Table 1 summarizes the treatment and control reactors prepared. Reagent control reactors, consisting of reagent only were constructed by filling 110 milliliter (mL) bottles with 8.6 grams per liter (g/L) sodium permanganate (NaMnO_4) solution. Additional control reactors consisting of Site soil in Milli-QTM water (Soil Leach control; SLC) were prepared by adding 50 grams (g) of Site soil to 110 mL bottles and filling with Milli-QTM water. Soil Treatment (ST) reactors were constructed by adding 50 g of Site soil to 110 mL bottles and filling with 8.6 g/L NaMnO_4 solution. All control and treatment reactors were prepared in triplicate and capped with Teflon-lined screw caps. Batch reactors were incubated in a dark environment over the reaction period. The NaMnO_4 concentration was measured on day 0, 7 and 28 days for the Controls and on days 0, 7, 14, 21 and 28 for the ST reactors.

2.2 Sampling and Analysis

Samples were collected from the Control and Treatment reactors using disposable 5 mL plastic syringes for analysis of permanganate. KMnO_4 concentration was quantified colorimetrically using a UV/VIS spectrophotometer (Biochrom Ultraspec 1000). 3 mL samples from batch reactors were syringe filtered through a 0.45 micron (μm) filter and diluted as necessary so that the absorbance reading at 525 nanometer (nm) was less than 2.0 absorbance units. Calibration curves were prepared daily using known concentrations of a standardized KMnO_4 solution.

3. RESULTS

Table 2 provides a summary of the natural oxidant demand calculated over the 28 day incubation period for the test presented in units of gram per kilogram (g/kg). Appendix A contains the results for each soil location and the replicates prepared for each.

The maximum natural oxidant demand was 3.8 g/kg in the location identified as URS 1-22' and 2 samples (locations URS 1-29' and URS 1-49') had no measurable demand. These data suggest the samples have a low natural oxidant demand which is consistent with soils with low organic carbon contents.

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TABLES

TABLE 1: SUMMARY OF CHEMICAL OXIDATION TREATMENTS AND CONTROLS
 Cornell Dubilier Electronics, Venice Beach, CA

Control/Treatment	# of Treatments	# of Batch Reactors	Batch Reactor Constituents					Reaction Duration	Analytical Parameters
			Deionized Water	NaMnO ₄ Solution*	Site Ground-water	Stock Solution NaMnO ₄	Site Soil		MnO ₄
								(Days)	no quench
Controls									
Background Reagent Control	1	3				to fill 110 mL**		0 7 28	✓ ✓
Soil Leach Control (SLC)	6	18	to fill 110 mL**				50g	0 28	✓ ✓
Treatments									
Soil Treatment (ST)	6	18		to fill 110 mL**			50g	0 7 14 21 28	✓ ✓ ✓ ✓ ✓
Number of Treatments	13								
Number of Batch Reactors	39								

Notes:

* Target concentration 10g/l MnO₄

** Measure volume added by weighing bottle before and after

NaMnO₄ - sodium permanganate

TABLE 2: SUMMARY OF OXIDANT DEMAND RESULTS
Cornell Dubilier, Electronics, Venice Beach, CA

SiREM

Treatment	Customer Sample ID	Corrected Natural Oxidant Demand*
ST-1	URS 1-22'	3.8
ST-2	URS 1-29.5'	ND
ST-3	URS 1-35'	1.5
ST-4	URS 1-49'	ND
ST-5	URS 3-20.5'	0.9
ST-6	URS 3-40.5'	2.4

Notes:

* Natural oxidant demand at 28 days incubation, corrected for autocatalytic decomposition of permanganate in reagent control

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APPENDIX A: OXIDANT DEMAND TEST RESULTS

OXIDANT DEMAND RESULTS Sample ST-1

Lab ID	Client ID
Sample ST-1	URS-1-22'

Ave Mass DI water (g)	83.12
Ave Mass soil (day 1) (g)	50.08

Treatment	Time (days)	NaMnO4 (g/L)				Mass of NaMnO4 (mg)	Uncorrected Natural Oxidant Demand (g/kg)
		Replicate No. 1	Replicate No. 2	Replicate No. 3	average		
ST-1	0	6.07	7.30	7.47	6.95	577.48	0
	7	5.70	5.87	5.92	5.83	484.48	1.9
	14	5.25	5.25	5.03	5.18	430.30	2.9
	21	4.80	4.80	4.86	4.82	400.90	3.5
	28	4.61	4.55	4.55	4.57	379.80	3.9

Notes

g/kg - grams NaMnO4 per kilogram of soil

NaMnO4 - sodium permanganate

OXIDANT DEMAND RESULTS Sample ST-2

Lab ID	Client ID
Sample ST-2	URS-1-29.5'

Ave Mass DI water (g)	86.26
Ave Mass soil (day 1) (g)	50.80

Treatment	Time (days)	NaMnO4 (g/L)				Mass of NaMnO4 (mg)	Natural Oxidant Demand (g/kg)
		Replicate No. 1	Replicate No. 2	Replicate No. 3	average		
ST-2	0	7.75	7.19	7.81	7.58	654.22	0
	7	7.99	7.99	8.04	8.01	690.72	ND
	14	8.04	7.82	8.04	7.97	687.51	ND
	21	7.99	8.04	8.04	8.03	692.33	ND
	28	7.92	8.03	7.98	7.98	688.14	ND

Notes

g/kg - grams NaMnO4 per kilogram of soil

NaMnO4 - sodium permanganate

ND - no measurable demand

OXIDANT DEMAND RESULTS Sample ST-3

Lab ID	Client ID
Sample ST-3	URS-1-35.5'

Ave Mass DI water (g)	79.64
Ave Mass soil (day 1) (g)	50.07

Treatment	Time (days)	NaMnO4 (g/L)				Mass of NaMnO4 (mg)	Natural Oxidant Demand (g/kg)
		Replicate No. 1	Replicate No. 2	Replicate No. 3	average		
ST-3	0	6.74	7.47	7.70	7.30	581.64	0
	7	6.76	6.82	6.87	6.82	542.80	0.8
	14	6.65	6.59	6.76	6.67	530.93	1.0
	21	6.37	6.42	6.48	6.42	511.65	1.4
	28	6.24	6.18	6.29	6.24	496.63	1.7

Notes

g/kg - grams NaMnO4 per kilogram of soil
NaMnO4 - sodium permanganate

OXIDANT DEMAND RESULTS Sample ST-4

Lab ID	Client ID
Sample ST-4	URS-1-49'

Ave Mass DI water (g)	83.24
Ave Mass soil (day 1) (g)	50.05

Treatment	Time (days)	NaMnO4 (g/L)				Mass of NaMnO4 (mg)	Natural Oxidant Demand (g/kg)
		Replicate No. 1	Replicate No. 2	Replicate No. 3	average		
ST-4	0	6.63	6.46	7.42	6.84	568.96	0
	7	7.37	7.43	7.37	7.39	615.39	ND
	14	7.37	7.26	7.21	7.28	606.09	ND
	21	7.15	7.21	7.09	7.15	595.24	ND
	28	7.02	7.13	7.13	7.10	590.79	ND

Notes

g/kg - grams NaMnO4 per kilogram of soil

NaMnO4 - sodium permanganate

ND - no measurable demand

OXIDANT DEMAND RESULTS Sample ST-5

Lab ID	Client ID
Sample ST-5	URS-3-20.5'

Ave Mass DI water (g)	83.32
Ave Mass soil (day 1) (g)	49.63

Treatment	Time (days)	NaMnO4 (g/L)				Mass of NaMnO4 (mg)	Natural Oxidant Demand (g/kg)
		Replicate No. 1	Replicate No. 2	Replicate No. 3	average		
ST-5	0	6.97	7.75	7.75	7.49	624.12	0
	7	7.43	7.32	7.37	7.37	614.43	0.2
	14	7.21	7.15	7.15	7.17	597.36	0.5
	21	7.04	7.15	7.09	7.09	591.15	0.7
	28	6.91	6.63	6.97	6.84	569.51	1.1

Notes

g/kg - grams NaMnO4 per kilogram of soil

NaMnO4 - sodium permanganate

OXIDANT DEMAND RESULTS Sample ST-6

Lab ID	Client ID
Sample ST-6	URS-3-40.5'

Ave Mass DI water (g)	82.61
Ave Mass soil (day 1) (g)	49.96

Treatment	Time (days)	NaMnO4 (g/L)				Mass of NaMnO4 (mg)	Natural Oxidant Demand (g/kg)
		Replicate No. 1	Replicate No. 2	Replicate No. 3	average		
ST-6	0	6.52	7.75	7.92	7.40	611.09	0
	7	6.65	6.48	6.59	6.57	543.06	1.4
	14	6.20	6.31	6.31	6.28	518.45	1.9
	21	5.98	6.09	6.15	6.07	501.53	2.2
	28	5.67	5.90	6.01	5.86	484.23	2.5

Notes

g/kg - grams NaMnO4 per kilogram of soil

NaMnO4 - sodium permanganate

OXIDANT DEMAND RESULTS Reagent control

Lab ID	Client ID
BRC	0

Ave Mass DI water (g)	108
Ave Mass soil (day 1) (g)	0

Treatment	Time (days)	NaMnO4 (g/L)				Mass of NaMnO4 (mg)	mass loss (mg)
		Replicate No. 1	Replicate No. 2	Replicate No. 3	average		
BRC	0	8.71	8.43	8.26	8.46	915.91	
	7	8.27	8.60	8.55	8.47	916.83	
	28	8.26	8.48	8.37	8.37	905.77	10.13

Notes

NaMnO4 - sodium permanganate

APPENDIX C

**ISCO LABORATORY TREATABILITY TEST
PROTOCOL**

**ISCO LABORATORY TREATABILITY TEST PROTOCOL
CORNELL DUBILIER ELECTRONICS SITE
LOS ANGELES, CALIFORNIA**

A matrix oxidant demand test will also be performed to assess the amount of oxidant that would be consumed by the naturally-occurring organic matter and VOCs in soil and groundwater samples collected from boreholes drilled at the Site. The following text describes the procedures and protocol that will be implemented in this bench-scale test.

The natural oxidant demand of the soil will be determined using replicate batch reactors containing aliquots of soil and a standardized permanganate solution. Approximately 10 g of wet soil, weighed to 0.1 milligrams (mg), is added to 25 milliliter (mL) pre-weighed volatile organic analyte (VOA) vials. The soil will be dried overnight at 105°C, cooled in a desiccator, and weighed to the nearest 0.1 mg. Aliquots of potassium permanganate (KMnO₄) solution (15.0 milliliters of 1.8 grams per liter KMnO₄) will be added to each vial. Vials will be capped, vigorously shaken by hand for several seconds, and laid sideways on a darkened shaker at 150 rpm. Two control vials will be filled with KMnO₄ solution only. Sample vials will be periodically sacrificed by removing vials in duplicate from the shaker, allowing the soil to settle for a few minutes, removing about 3 mL of supernatant from the vial with a 3 mL plastic syringe, and filtering the supernatant through a 0.8 micrometer syringe-tip filter into a glass vial. Samples will be diluted as appropriate, and the absorbance at 525 nanometers will be measured on a Biochrom Ultrospec 1000 spectrophotometer.

The natural oxidant demand of the groundwater will also be determined by a similar testing procedure. Batch tests will be performed by adding sodium permanganate (100X stoichiometric oxidant demand) to filtered groundwater in sealed glass vials with zero-headspace, and allowing the solution to react over 48 hours in a temperature-controlled, darkened environment. Treatments and controls (Reagent Control, Intrinsic Control) will be prepared in triplicate (nine bottles in total). Two controls will be constructed to: (i) assess the pre-treatment concentrations of the oxidizable species in the groundwater (Intrinsic Control); and ii) to assess the background levels of each analyte in the sodium permanganate (Background Reagent Control). The concentrations of VOCs, inorganic species such as anions, sulfides, and

metals (especially iron and manganese), and dissolved organic carbon will be measured in the groundwater prior to permanganate addition and at 48 hours to determine the magnitude and rate of change from background conditions.

The change in permanganate concentration will be used to determine the oxidant demand of the groundwater, and the change in TCE concentration over time will be used to assess the rate of TCE degradation. The batch tests will also be monitored for the formation of any precipitates such as iron oxides or manganese dioxide that could affect the design of an oxidant injection system. The data from this test will be used to evaluate the expected costs and performance of ISCO at the Site.

EXHIBIT 1

TECHNICAL MEMORANDUM

RISK-BASED CONCENTRATIONS FOR PCBs

**TECHNICAL MEMORANDUM
DEVELOPMENT OF TARGET CLEANUP LEVELS
4144 GLENCOE AVENUE SITE
LOS ANGELES, CALIFORNIA**

1.0 GENERAL

This memorandum presents the development of a target cleanup level for PCBs in on-site soils to support the Feasibility Study for the 4144 Glencoe Avenue Site in Los Angeles, California (the Site). The potential receptors evaluated for the development of on-site soil target cleanup levels include a future On-site Landscaper

A soil target cleanup level for PCBs was developed using human health risk assessment methodology in accordance with United States Environmental Protection Agency (USEPA) guidance and was based on the exposure algorithms used in the Baseline Risk Assessment. The following exposure routes were evaluated for future on-Site landscapers: incidental ingestion of soils, dermal contact with soils, and inhalation of dust/vapors in outdoor air.

2.0 TARGET CLEANUP LEVEL DEVELOPMENT

Based on the results of the risk assessment, areas of the Site contain PCB concentrations that may potentially pose an unacceptable health risk (greater than 1×10^{-5}) to future on-Site landscapers. Future on-Site landscapers are the only post-development receptors that may regularly come in contact with residual PCBs in soil. Therefore, to mitigate these potential health risks, development of Site-specific risk-based cleanup levels for PCBs is recommended. The cleanup levels can be used to achieve the remedial goals for the Site.

The remedial goal is defined in terms of the area-wide exposure point concentration (i.e., UCL95) that would result in acceptable risk levels (e.g., cancer risk range of 10^{-4} to 10^{-6}) for a receptor traversing the Site. In other words the UCL95 concentration for the Site would need to be less than or equal to the remedial goal. A cleanup level can then be determined in an iterative fashion so that if concentrations above the cleanup level are removed from the Site the UCL95 would meet the remedial goal over the exposure area.

In the risk assessment, the direct contact (incidental ingestion and dermal contact) and outdoor air inhalation pathways were evaluated using exposure algorithms following USEPA and DTSC risk assessment guidance [USEPA, 2004, USEPA 2005,

Cal/EPA 2005]. These same algorithms were used, with slight modifications as outlined below, to develop target remedial goals for a future on-Site landscaper.

Chemical-specific soil remedial goals were derived first by calculating cancer risk and noncancer hazard using a unitized soil concentration of 1 mg/kg for PCBs. In other words, cancer risks and noncancer hazards were estimated for an on-Site landscaper assuming exposures to soil concentrations of 1 mg/kg for PCBs via incidental soil ingestion, dermal soil contact, and outdoor air inhalation of vapors/dust. To calculate cancer risk from exposure via incidental ingestion of soil, the following equation was used:

$$CR_{\text{ingestion}} \text{ or } HQ_{\text{ingestion}} = \frac{C_s \times \text{IngR} \times \text{ABS} \times \text{EF} \times \text{ED} \times \text{CF} \times (\text{CSF}_o \text{ or } 1/\text{RfD}_o)}{\text{BW} \times \text{AT}}$$

Where:

$CR_{\text{ingestion}}$ = Chemical-specific cancer risk, incidental ingestion pathway

$HQ_{\text{ingestion}}$ = Chemical-specific noncancer hazard quotient

C_s = unitized chemical concentration in soil (1.0 mg/kg)

IngR = ingestion rate of soil (mg/day)

ABS = percent absorption (assumed to be 100 percent)

EF = exposure frequency (days/year)

ED = exposure duration (years)

CF = conversion factor for soil (10^{-6} kg/mg)

CSF_o = oral cancer slope factor (mg/kg-day^{-1})

RfD_o = oral noncancer reference dose (mg/kg-day)

BW = body weight (kg)

AT = averaging time (days)

cancer effects: 70 years x 365 days = 25,550 days

noncancer effects: ED x 365 days

To calculate cancer risk from exposure via dermal contact with soil, the following equation was used:

$$CR_{\text{dermal}} \text{ or } HQ_{\text{dermal}} = \frac{C_s \times \text{SA} \times \text{AF} \times \text{EF} \times \text{ED} \times \text{CF} \times \text{DAF} \times (\text{CSF}_o \text{ or } 1/\text{RfD}_o)}{\text{BW} \times \text{AT}}$$

Where:

CR_{dermal} = Chemical-specific cancer risk, dermal contact pathway

HQ_{dermal} = Chemical-specific noncancer hazard quotient
 C_s = unitized chemical concentration in soil (1.0 mg/kg)
 SA = skin surface area exposed to soil per day (cm^2/day)
 AF = soil-skin adherence factor (mg/cm^2)
 CF = conversion factor (10^{-6} kg/mg)
 DAF = dermal absorption factor (unitless, chemical-specific)

To calculate cancer risk from exposure via inhalation of vapors and fugitive dust from soil, the following equation was used:

$$CR_{\text{inh}} \text{ or } HQ_{\text{inh}} = \frac{C_s \times \text{InhR} \times \text{ABS} \times \text{EF} \times \text{ED} \times (\text{CSF}_i \text{ or } 1/\text{RfD}_i)}{\text{BW} \times \text{AT} \times (\text{PEF} \text{ or } \text{VF})}$$

Where:

CR_{inh} = Chemical-specific cancer risk, outdoor inhalation pathway
 HQ_{inh} = Chemical-specific noncancer hazard quotient
 C_s = unitized chemical concentration in soil (1.0 mg/kg)
 InhR = inhalation rate (m^3/day)
 ABS = percent absorption (assumed to be 100 percent)
 CSF_i = inhalation cancer slope factor ($\text{mg}/\text{kg}\text{-day}$)⁻¹
 RfD_i = inhalation noncancer reference dose ($\text{mg}/\text{kg}\text{-day}$)

Subsequently, the cancer risks and noncancer hazards are summed together across exposure routes to yield a cumulative risk for PCBs (e.g., $CR_{\text{ingestion}} + CR_{\text{dermal}} + CR_{\text{inhalation}}$ = Cumulative Cancer Risk). Assuming a chemical-specific target cancer risk of 1×10^{-5} and a target noncancer hazard quotient (HQ) of 1.0, the remedial goals were estimated using the following equations:

$$\text{Remedial Goal}_{\text{carcinogen}} = [1.0 / (\text{Cumulative Cancer Risk})] \times \text{Target Risk}$$

$$\text{Remedial Goal}_{\text{noncarcinogen}} = [1.0 / \text{Cumulative HQ}] \times \text{Target HQ}$$

Detailed calculations for the remedial goals are presented in Tables 1 through 4. Table 1 presents the derivation of the particulate emission factor (PEF) for the outdoor fugitive dust pathway for a future landscaper. The formula for the PEF derivation is listed at the bottom of Table 1 and was taken from USEPA guidance [USEPA 2002]. The soil remedial goals for a future on-Site landscaper are summarized

in Table 4. The same soil remedial goal of 6.4 mg/kg was calculated for each Aroclor (1248, 1254, and 1260).

3.0 APPLICATION OF THE TARGET CLEANUP LEVEL

To develop the target clean up level for PCBs, the Site data from 0 to 10 feet below ground surface (bgs) were compiled into a database. The database was then evaluated to determine what sample concentrations needed to be removed to result in an UCL95 of 6.4 mg/kg. Based on the database evaluation, it was determined that if PCB concentrations of greater than 17 mg/kg were removed from the top 10 feet of soils, the UCL95 would be lower than the remedial goal of 6.4 mg/kg. Therefore, the value of 17 mg/kg was used in the Feasibility Study to identify areas and volumes for PCB remediation in shallow soils (0 to 10 feet bgs).

4.0 REFERENCES

California Environmental Protection Agency (Cal-EPA), 2005. Cancer Potency Factors - Toxicity Criteria Database. Office of Environmental Health Hazard Assessment. Website address: <http://www.oehha.ca.gov/risk/chemicalDB/index.asp>.

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USEPA, 2004. U.S. EPA Region IX Preliminary Remedial Goal (PRG) Table.

USEPA, 2002. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. Office of Solid Waste and Emergency Response. OSWER 9355.4-24.

TABLE 1
PEF Derivation
Human Health Risk Assessment
4144 Glencoe Avenue Site
Los Angeles, California

Soil Parameters	Value	Units	Reference
Inverse of mean conc. at center (Q/C)	56.8	(g/m ² -s per kg/m ³)	1.4-acre site in Los Angeles (USEPA 2001a)
Fraction of vegetative cover (G)	0.5	unitless	Default (USEPA 2001a)
Mean Annual Windspeed (Um)	4.69	m/s	Default (USEPA 2001a)
Equivalent threshold value of windspeed, 7m (Ut)	11.32	m/s	Default (USEPA 2001a)
Function dependent on Um/Ut (Fx)	1.9E-01	unitless	Default (USEPA 2001a)
Particulate Emission Factor (PEF)	8.2E+08	m ³ /kg	Calculated

Formula (USEPA 2002):

$$PEF = Q/C * [3600 / (0.036 * (1-G) * (Um/Ut)^3 * Fx)]$$

TABLE 2
Calculation of Cancer Risk and Noncancer Hazard
Ingestion/Dermal Contact with Soil: Landscaper
4144 Glencoe Avenue Site
Los Angeles, California

Exposure Route	Chemical of Potential Concern	Soil EPC mg/kg	Noncancer Intake mg/kg-day	Reference Dose mg/kg-day	Hazard Quotient	Cancer Intake mg/kg-day	Cancer Slope Factor mg/kg-day ⁻¹	Cancer Risk
Ingestion	PCBs							
	Aroclor 1248	1.0E+00	6.7E-07	--	--	2.4E-07	5.0E+00	1.2E-06
	Aroclor 1254	1.0E+00	6.7E-07	2.0E-05	3.4E-02	2.4E-07	5.0E+00	1.2E-06
	Aroclor 1260	1.0E+00	6.7E-07	--	--	2.4E-07	5.0E+00	1.2E-06
Total Risk and HI for Incidental Ingestion =					3.4E-02			3.6E-06
Dermal	PCBs							
	Aroclor 1248	1.0E+00	2.0E-07	--	--	7.2E-08	5.0E+00	3.6E-07
	Aroclor 1254	1.0E+00	2.0E-07	2.0E-05	1.0E-02	7.2E-08	5.0E+00	3.6E-07
	Aroclor 1260	1.0E+00	2.0E-07	--	--	7.2E-08	5.0E+00	3.6E-07
Total Risk and HI for Dermal Contact =					1.0E-02			1.1E-06

TABLE 3
Calculation of Cancer Risk and Noncancer Hazard
Inhalation of Soil Vapors/Particulates: Landscaper
4144 Glencoe Avenue Site
Los Angeles, California

Exposure Route	Chemical of Potential Concern	Soil EPC mg/kg	Noncancer Intake mg/kg-day	Reference Dose mg/kg-day	Hazard Quotient	Cancer Intake mg/kg-day	Cancer Slope Factor mg/kg-day ⁻¹	Cancer Risk
Inhalation	PCBs							
	Aroclor 1248	1.0E+00	4.9E-11	--	--	1.8E-11	2.0E+00	3.5E-11
	Aroclor 1254	1.0E+00	4.9E-11	2.0E-05	2.5E-06	1.8E-11	2.0E+00	3.5E-11
	Aroclor 1260	1.0E+00	4.9E-11	--	--	1.8E-11	2.0E+00	3.5E-11
Total Risk and HI for Outdoor Air Inhalation =					2.5E-06			1.1E-10
Total Risk and HI Across All Exposure Routes/Pathways =					4.4E-02			4.7E-06

TABLE 4
Calculation of Soil Cleanup Levels
4144 Glencoe Avenue Site
Los Angeles, California

Chemical of Potential Concern	Soil EPC mg/kg	Incidental Ingestion	Dermal Contact	Inhalation	Total Noncancer Hazard	Soil Noncancer CUL	Incidental Ingestion	Dermal Contact	Inhalation	Total Cancer Risk	Soil Cancer CUL
PCBs											
Aroclor 1248	1.0E+00	--	--	--	--	--	1.2E-06	3.6E-07	3.5E-11	1.6E-06	6.4E+00
Aroclor 1254	1.0E+00	3.4E-02	1.0E-02	2.5E-06	4.4E-02	2.3E+01	1.2E-06	3.6E-07	3.5E-11	1.6E-06	6.4E+00
Aroclor 1260	1.0E+00	--	--	--	--	--	1.2E-06	3.6E-07	3.5E-11	1.6E-06	6.4E+00

EXHIBIT 2

TECHNICAL MEMORANDUM

RISK-BASED CONCENTRATIONS FOR TCE & PCE

M E M O R A N D U M

TO: Gerald Chernoff, DTSC
Stephen Cutts, DTSC

FROM: Robert Ettinger, GeoSyntec Consultants

COPY: Laurie Burt, Foley Hoag LLP
Mark Schultheis, GeoSyntec Consultants
Ruth Custance, GeoSyntec Consultants

DATE: March 30, 2005

SUBJECT: **4144 Glencoe Avenue Site, Venice, California**
Risk Based Concentration Calculations for the Vapor Intrusion
Pathway

The enclosed spreadsheets have been prepared to permit calculation and confirmation of the risk based concentrations (RBC) for the vapor intrusion pathway for the 4144 Glencoe Avenue Site. These spreadsheets conform to the USEPA and DTSC Johnson and Ettinger Model spreadsheets (USEPA, 2003, Johnson and Ettinger 1991) upgraded to evaluate the effect of passive sub-surface vapor barriers on contaminant vapor intrusion and calculate RBCs. Three spreadsheets are provided:

1. JEM Model MixedUse_Comm_Receptor.xls: This spreadsheet calculates the RBCs for the commercial occupant on the ground floor of a mixed use building. These calculations assume that the ground floor is commercial and the 2nd floor is residential. The exposure assumptions for the commercial receptor include an exposure frequency of 12 hours a day for 250 days per year. The exposure duration for the commercial receptor is assumed to be 25 years. A target risk of 1E-05 is assumed for the commercial receptor.

2. JEM Model MixedUse Res Receptor.xls: This spreadsheet calculates the RBCs for the residential occupant on the second floor of a mixed use building. These calculations assume that the ground floor is commercial and the 2nd floor is residential. The exposure assumptions for the residential receptor include an exposure frequency of 24 hours a day for 350 days per year. The exposure duration for the residential receptor is assumed to be 30 years. A target risk of 1E-06 is assumed for the residential receptor.
3. JEM Model Garage Res Receptor.xls: This spreadsheet calculates the RBCs for the residential occupant on the second floor over a ground floor garage. The exposure assumptions for the residential receptor include an exposure frequency of 24 hours a day for 350 days per year. The exposure duration for the residential receptor is assumed to be 30 years. A target risk of 1E-06 is assumed for the residential receptor.

Model Inputs for the Sub-Slab Vapor Barrier

The additional attenuation provided by a sub-slab vapor barrier is evaluated with these spreadsheets by adjusting the thickness of Stratum B. A thickness of 0.10 cm is input for a 40 mil liner¹ and a thickness of 0 is used to simulate the “No Controls” case.

The diffusion across the liner has been calculated to account for the low diffusivity of the liner and conservatively considers possible defects in the liner. To account for possible defects in the liner, the effective diffusion across the liner, $D_{\text{liner}}^{\text{eff}}$, is calculated by:

$$D_{\text{liner}}^{\text{eff}} = D_{\text{air}} \eta_{\text{liner}} + D_{\text{liner}} (1 - \eta_{\text{liner}}) \quad (1)$$

where:

D_{air} is the diffusion coefficient for the VOC in air (cm²/s);

η_{liner} is the liner defect area ratio, (cm² defects/cm² liner); and

D_{liner} is the diffusion coefficient for VOCs through the liner material (cm²/s).

The first term in this expression accounts for the diffusion across the liner defects and the second term represents the diffusion across the liner (with no defects).

¹ A 40 mil liner is 0.040 inches thick = 0.102 cm

A literature review has been conducted to select a conservative representative value for the diffusion coefficient of VOCs through the liner material². References examined in this evaluation are provided below. Reported diffusion coefficients for polyethylene geomembranes, D_{liner} , range from 2.9×10^{-9} to 7.9×10^{-9} cm²/s. A conservative diffusion coefficient of 1×10^{-8} cm²/s was used for the RBC calculation³.

A literature review was conducted to determine a conservative value for the liner defect area ratio. The literature provides a conservative estimate for the liner defect area ratio of 1 cm² per acre of liner (1 acre is approximately 4000 m²). As a further level of conservatism, the literature estimate was increased by a factor of 4, to a liner defect area ratio of 4 cm² per acre ($4 \text{ cm}^2/4000 \text{ m}^2 = 1 \times 10^{-7}$), for the RBC calculations.

Modeling Air Exchange between Ground Floor and Second Floor Units

The Johnson & Ettinger model is used to calculate the attenuation factor for soil gas to ground floor indoor air. An attenuation factor for vapor migration between the first floor and the second floor is then used to calculate an overall attenuation factor for residents on the second floor. A leakage factor for indoor air flow between floors was established based on published studies of air flow distribution in multifamily buildings. Measured air leakage between residential units on the lower floors ranged from less than 4% to approximately 2%. These studies were conducted on buildings in colder climates (Minnesota and Massachusetts) where stack effects are likely to be more significant than in California. An average air leakage value of 3% is used in the RBC calculations. Consequently, the VOC concentration in 2nd floor units is estimated to be

² Note that in earlier calculations, the USEPA/DTSC Johnson & Ettinger spreadsheet was used to provide a preliminary estimate of the effective diffusion coefficient for the liner. In these earlier calculations, this order-of-magnitude estimate for the diffusion coefficient was made by approximating the liner material as a porous media with a very low air content (total porosity = 0.43 and air volumetric content of 0.01) and an adjustment factor of 100 to obtain a reasonable order of magnitude for the diffusion coefficient. Consequently, calculations presented earlier are not directly comparable to the results presented in this memo. Calculating the liner diffusion coefficient using this earlier, approximate approach results in RBC estimates that are a factor of 6 to 8 times different (lower) than the results presented herein. The attached spreadsheets include the option to calculate the RBCs using this earlier assumption for liner diffusion coefficient. While this earlier approach results in liner diffusion coefficient estimates which are likely within an order-of-magnitude of the actual value, the refined approach using Equation (1) is more technically correct because it does not treat the liner as a porous media and because it is based on the more current data published in the literature.

³ Therefore, the value of 1×10^{-8} adopted for the liner diffusion coefficient is over 25% more conservative than the value found in the literature cited below.

33 times lower than the concentration in the ground floor structure. This attenuation value is considered to be conservative (i.e., a higher reduction is expected) given the building ventilation code requirements for new construction in California⁴.

Other Model Inputs

A list of the model inputs used for the vapor intrusion RBC calculations is provided in Table 1. All input parameters used for the RBC calculations for the “No Controls” scenarios are included in the spreadsheets provided. To calculate RBCs for scenarios including the sub-slab vapor barrier, the liner thickness has been input as “Thickness of Soil Stratum B in cell H25 and soil gas entry rate value has been input as “Qsoil” in cell L47.

Model Results

The RBC model calculations are summarized in Table 2 and Figure 1. For the mixed use scenarios (commercial first floor/residential upper floors), both the calculated RBCs for the ground floor commercial and 2nd floor residential are provided. However, since the RBC based on the residential receptor is slightly lower than the RBC for the commercial receptor, the residential RBC is the limiting RBC.

The RBC model calculations can be used to assess the calculated effectiveness of the passive subsurface vapor barrier. The calculated RBCs for the commercial/residential scenarios including a subsurface vapor barrier with a 40 mil liner are approximately 100 times greater than the No Controls cases. This is equivalent to a 99% effectiveness for this barrier. The calculated RBCs for the garage scenario, including a subsurface vapor barrier with a 40 mil liner, are approximately 50 times greater than the No Controls case. This is equivalent to a 98% effectiveness for this barrier.

⁴ 2001 California Building Code (24 CCR Part 2, vol 1), 2001 California Mechanical Code (24 CCR Part 4), and ANSI/ASHRAE Standard 62.2-2004 - Ventilation and Acceptable Indoor Air Quality in Low-Rise Residential Buildings.

Evaluation of Post-Remedy Soil Vapor Concentrations

The results of the post-remediation soil vapor survey will be used to evaluate post-remediation risks from residual TCE and PCE soil vapor concentrations. Land use zoning for this area permits a building size on the site of approximately 27,000 square feet.⁵ Therefore, to accurately evaluate residual soil vapor risks, an average of all of the data that may be present beneath the building must be considered. This is because soil vapor flux into the building and resulting indoor air concentrations are not dependent on the soil vapor concentration at a single point and single point of entry, but rather the average flux that is distributed across the entire foundation. To calculate an average soil vapor concentration two methods are proposed: the 95 Upper Confidence Limit Concentration (95UCL) and an area-weighted average. These average soil vapor concentrations will then be compared to the RBCs discussed above.

Uncertainties

The results presented in this RBC analysis are based on site-specific parameter inputs which characterize the commercial exposures, building characteristics, liner properties, and subsurface properties.

- The commercial exposures are based on a 12-hour work day, for 250 days per year.
- Two building construction scenarios have been evaluated: (1) mixed use with commercial on the ground floor and residential on the second floor, and (2) residential occupancy on the second floor with a podium garage on the ground floor. Both of these scenarios incorporate slab on grade construction.
- The effective diffusivity of the liner has been calculated using measured values published in the literature for diffusion coefficients of VOCs through a HDPE liner and the potential for construction defects (tears, holes, or openings) in the liner. Proper quality control during liner installation is necessary to be consistent with the assumed liner properties used in the RBC calculations.

⁵ While zoning regulations would permit a larger footprint, a smaller footprint has been conservatively estimated. Actual development plans, if available, will be considered at the time of the post-remediation survey.

- The RBC calculations presented here are based on the geotechnical properties for the subsurface silty soils with soil vapor samples collected 10 feet below ground surface.

Modification of these parameters may increase or decrease the calculated RBCs.

Additionally, uncertainties that are common to all risk assessment calculations (e.g., toxicity values, exposure assumptions, source concentration assumptions) are also applicable to this evaluation.

References:

Vapor Intrusion References:

Johnson, P.C., and Ettinger, R.A. 1991. Heuristic Model for Predicting the Intrusion of Contaminant Vapors into Buildings. Environmental Science and Technology, v.25(8) 1445-1452.

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Air Flow Distribution:

Feustel HE and Diamond RC, 1996. Diagnostics and measurements of infiltration and ventilation systems in high-rise apartment buildings. Published in the Proceedings of the 1996 Summer Study on Energy Efficiency in Buildings, American Council for an Energy Efficient Economy, Washington DC, August, 1996.http://epb.lbl.gov/homepages/Rick_Diamond/Highrise_aceee_96.pdf

Center for Energy and Environment, 2004. Reduction of Environmental Tobacco Smoke Transfer in Minnesota Multifamily Buildings Using Air Sealing and Ventilation Treatments. <http://www.mncee.org/ceedocs/mpaat/summary.pdf>

* * * * *

Figure 1
Risk Based Concentration Evaluation
Sample Depth 10 ft bgs

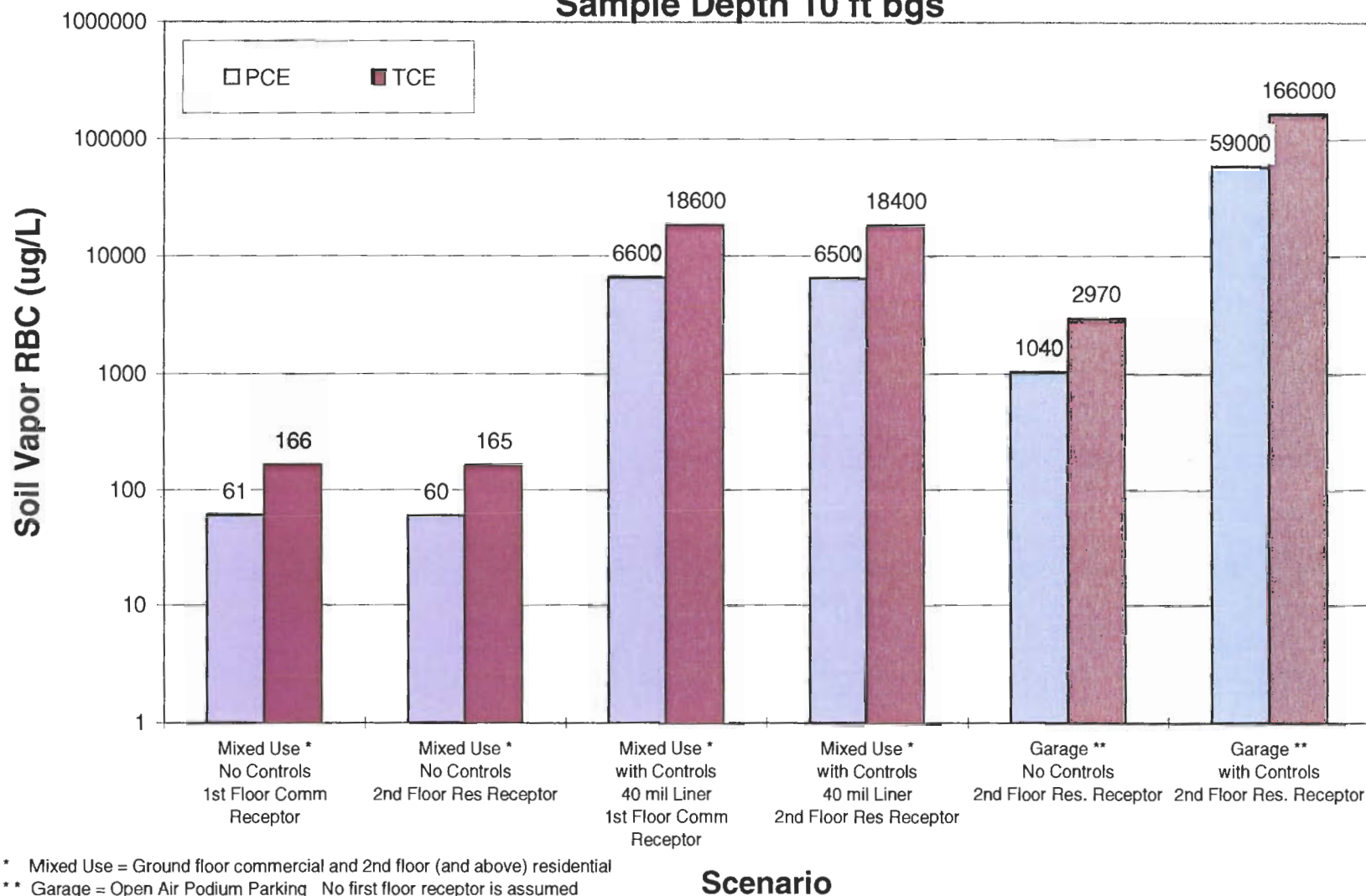


EXHIBIT 3

TECHNICAL MEMORANDUM CONTINGENCY PLAN FOR ELECTRICAL RESISTANCE HEATING REMEDIAL OPTION



M E M O R A N D U M

TO: Stephen Cutts, DTSC
Gerald Chernoff, DTSC

FROM: Andrew Barnes, GeoSyntec Consultants
Mark Schultheis, GeoSyntec Consultants

COPY: Laurie Burt, Foley Hoag LLP
Jonathan Ettinger, Foley Hoag LLP
Ruth Custance, GeoSyntec Consultants

DATE: 29 March 2005

SUBJECT: **4144 Glencoe Avenue Site, Venice, California**
Contingency Plan for Electrical Resistance Heating Remedial Option

During our meeting on 8 March 2005, DTSC requested that CDE develop an approach to remediation monitoring and contingency planning in connection with the application of electrical resistance heating (ERH) in the volatile organic compound (VOC) dense non-aqueous phase liquid (DNAPL) source zone at 4144 Glencoe Avenue (Site). This memorandum has been prepared to outline an approach to monitor potential mobilization of trichloroethylene (TCE) or perchloroethylene (PCE) DNAPL outside the zone of ERH treatment, and contingency planning.

Prior to the ERH implementation, two sentinel wells would be installed downgradient of the ERH zone. Although the final locations of sentinel wells would be selected based on input from the ERH contractor, the locations would be selected to minimize the travel time from the area of ERH, yet the wells would be beyond the hydraulic influence of the ERH system. The screened intervals of the sentinel wells would be constructed within coarse-grained soils in which mobile DNAPL can migrate

more easily and can result in higher dissolution rates than would be expected in fine-grained soils.

The sentinel wells would be sampled before, and periodically during and after ERH, and the results of chemical analyses would be compared to target levels prepared and submitted as part of the remedial design. In the event that a significant amount of TCE or PCE DNAPL migrates from the ERH treatment area during or immediately following the ERH treatment, chemical oxidant (permanganate) would be injected into wells within or downgradient of the zone of treatment to reduce and manage concentrations.